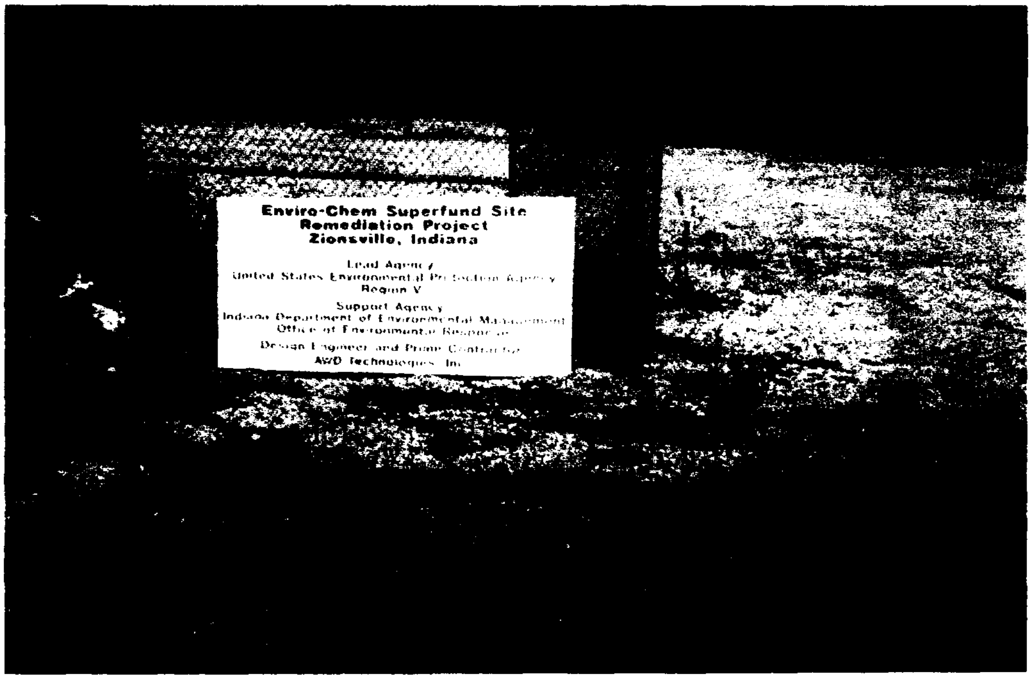
Prepared for:
RRA Enviro-Chem Superfund Site
Zionsville, Indiana

VERSAR'S FIELD CONSTRUCTION PLANS
- Construction Site Management Plan
- Construction Quality Control Plan
- Health and Safety Plan



Submitted by:

Versar INC.
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In Association With:

Handex®

November 1997

Versar INC.

February 27, 1998

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Washington, D.C. 20036
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Re: Revised Remedial Action (RRA) at the Enviro-Chem Site, Zionsville, Indiana
Versar's Revised Field Construction Plans (Revision 2)

Dear Trustees:

Versar is submitting the revised pages/sections of Field Construction Plans for inclusion in your Field Construction Plans binder. These plans, including the Construction Site Management Plan (CSMP), Construction Quality Control Plan (CQCP), and Health and Safety Plan (HASP), have been revised in accordance with the comments received at the Pre-Construction Conference on November 20, 1997, and those received from Radian on November 26, 1997, December 2, 1997, and December 19, 1997.

The revised pages/sections (i.e., Revision 2) should be inserted into the previously provided three-ring binders, replacing the original pages/sections (i.e., Revisions 0 and 1). The revised pages/sections have been separated with pale yellow card stock to assist you in the replacement process, and a summary of the revised pages/sections for each plan is provided below:

<u>CSMP</u>:
Replace Original Cover with Revised Cover
Replace Original Table of Contents with Revised Table of Contents
Replace Original Figure 2-1 (Page 2-2) with Revised Figure 2-1
Replace Original Page 2-9 with Revised Pages 2-9 and 2-10
Replace Original Sections 3.0 and 4.0 with Revised Sections 3.0 and 4.0

<u>CQCP</u>:
Replace Original Cover with Revised Cover
Replace Original Table of Contents with Revised Table of Contents
Replace Original Sections 2.0, 3.0, 4.0, and 6.0 with Revised Sections 2.0, 3.0, 4.0, and 6.0
Insert Additional Material Provided in Appendix B into end of Original Appendix B

HASP:

Replace Original Cover with Revised Cover
Replace Original Table of Contents with Revised Table of Contents
Replace Original Sections 1.0, 2.0, 3.0, and 5.0 with Revised Sections 1.0, 2.0, 3.0, and 5.0
Replace Original Figure 6-1 (Page 6-2) with Revised Figure 6-1 (Page 6-2)
Replace Original Page 7-1 with Revised Page 7-1
Replace Original Section 9.0 with Revised Section 9.0
Replace Original Page 10-5 with Revised Page 10-5
Replace Original Section 11.0 with Revised Section 11.0
Replace Original Pages 12-1 and 12-2 with Revised Pages 12-1 and 12-2
Replace Original Page 13-3 with Revised Page 13-3
Insert New Appendix C after Appendix B
Replace Cover of Original Appendix C with New Appendix D Cover

Should you have any questions or comments or require further clarification, please call me at (215) 788-7844, Extension 222.

Very truly yours,

G J Anastos

G.J. Anastos, Ph.D., P.E.
Vice President

Enclosures

cc: D. Basko (Versar)
J. Borucki (Versar)
C. Brown (Versar)
G. Hartup (Versar)
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Versar INC.

18 November 1997

Michael McAteer
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Vince L. Epps
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Sent Via Federal Express

Re: Enviro-Chem RRA, Zionsville, IN
Versar's Field Construction Plans

Dear Sirs:

Enclosed is a copy of the Field Construction Plans that will be distributed at the Pre-Construction Conference of 20 November, in Indianapolis. The Field Construction Plans include: Construction Site Management Plan, Construction Quality Control Plan and Health and Safety Plan.

Any page revisions that result from the Pre-Construction meeting and/or field conditions will be forwarded for insertion in the enclosed binder.

Should you have any questions with respect to these plans, please free to contact me at (215) 788-7844, extension 222.

Very truly yours,

G.J. Anastos

G.J. Anastos, Ph.D., P.E.
Project Manager

enclosure

cc: R Ball (w/o enclosure)
N Bernstein (w/o enclosure)
M Dowiak (w/o enclosure)
J Kyle (w/o enclosure)

1

Construction Site Management Plan

2

Construction Quality Control Plan

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Health and Safety Plan

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1

VERSAR'S
CONSTRUCTION SITE MANAGEMENT PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

PREPARED FOR:
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

VERSAR PROJECT NUMBER 3709

FEBRUARY 1998
REVISION 2

DOCUMENT RELEASE AUTHORIZATION

This Construction Site Management Plan has been prepared for the Environmental Conservation and Chemical Trust to control all site activities related to construction performed for the implementation of the Revised Remedial Action at the Enviro-Chem Superfund site in Zionsville, Indiana. This plan has been prepared in accordance with the requirements specified in Versar's Contract with the Trustees and the contract specifications prepared by Radian International, including Revised Exhibit A.

Charles J. Gaffney, P.O.E.
Construction Manager

David A. Basko
Quality Control Manager

George J. Anastos, Ph.D., P.E.
Remedial Project Manager

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1.0 PROJECT DESCRIPTION AND SCOPE OF WORK

1.1 Introduction

This Construction Site Management Plan (CSMP) has been developed to manage on-site facilities and operations during the Remedial Action Construction and Operations related to the implementation of the Remedial Action at the Enviro-Chem Superfund Site.

The CSMP provides a description of the Contractor's project organization and responsibilities, details regarding the support zone layout and operations, site security, and emergency procedures

1.2 Site Management Plan Objectives

This document is one of the remedial design plans required by Exhibit A to the Consent Decree. This CSMP is intended to provide details regarding the management of on-site facilities and operations during the Remedial Action Construction and Operations.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 Site Management Organization

Figure 2-1 presents a project organization chart which identifies the areas of responsibility and lines of authority for the Remedial Action construction activities. The Versar Construction Superintendent's (CS) interactions with the ECC Trust's Engineer (Engineer) are also described.

2.2 Responsibilities

Responsibilities of project personnel are described in the following subsections.

2.2.1 Remedial Project Manager

The Remedial Project Manager (PM) will have the primary responsibility for implementation of the project work in accordance with the project design, plans, and specifications. The Project Manager shall also provide the necessary communications interface with the following personnel:

- Engineer,
- Design Manager/Design Team,
- Construction Manager/Construction Team,
- O&M Manager/O&M Team,
- Health and Safety Officer, and
- Quality Control Manager

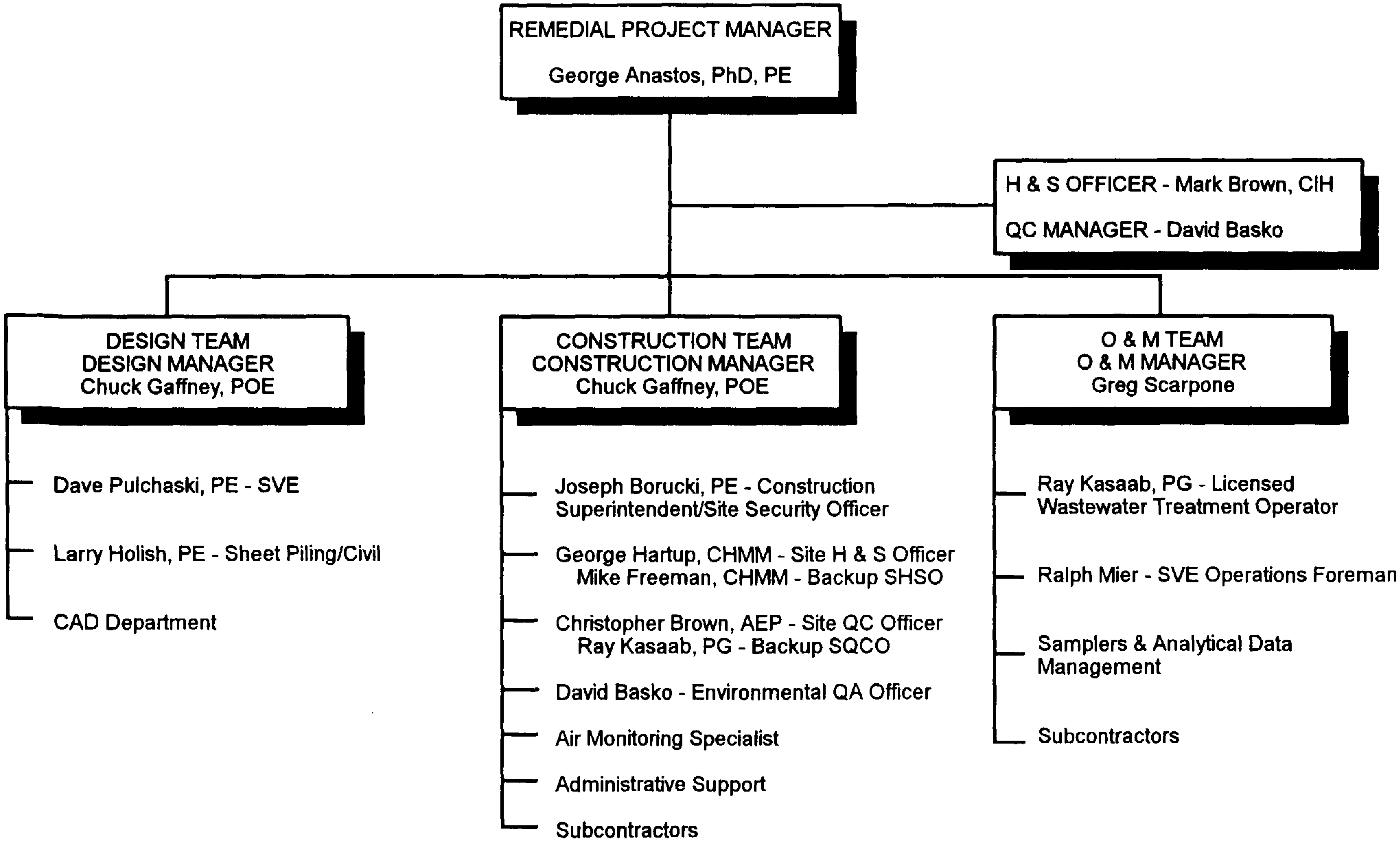
The PM, in the performance of his duties, will also require a staff of technical and administrative people that will report directly to him. The technical staff will provide the day-to-day technical back-up as it relates to the construction activities.

The administrative staff is necessary to perform day-to-day administrative functions. These administrative functions include such activities as:

- Tracking costs, invoices, and billing;
- Recordkeeping and filing;

FIGURE 2-1

VERSAR/HANDEX ENVIRO-CHEM PROJECT TEAM ORGANIZATION CHART



- Expediting of equipment and material orders and logging receipt upon delivery;
- Distribution of correspondence and reports;
- Tracking submittals using the Submittal Log; and
- Tracking of visitors to the site.

The PM will communicate directly with the Engineer and will oversee the Construction Manager.

2.2.2 Health and Safety Officer

The Health and Safety Officer (HSO) will function independent of the Construction Manager and the Engineer, and he will have primary responsibility for preparing and assuring compliance with the Health and Safety Plan. The HSO will report directly to the PM on all matters regarding health and safety, and he will also provide the necessary communications interface with the Site Health and Safety Officer. Specific responsibilities include:

- Conducting the initial site-specific health and safety orientation meeting and providing support for additional meeting, if required;
- Providing support for all on-site health and safety activities, as needed;
- Establishing new health and safety measures, as appropriate, based on changing conditions;
- Maintaining all related health and safety documentation;
- Performing health and safety system audits;
- Authority to stop work if conditions are deemed unsafe; and
- Authority to temporarily remove an individual from the site if he/she is not complying with HSP protocols.

2.2.3 Quality Control Manager

Versar's Quality Control Manager (QCM) and the Site QC Officer (SQCO) will function independent of the Construction Manager and the Engineer. The responsibility of the QCM is to perform those activities specified in the Versar's Construction Quality Control Plan (CQCP), which includes monitoring conformance to the plans and specifications by performing the necessary reviews, inspections, testing, and documentation.

The QCM is responsible for overall management of the Versar's Quality Control system and has the authority to act independently in all quality control matters. The QCM reports directly to the PM for quality control purposes only. Responsibilities of the QCM are outlined as follows:

- Managing the performance of all on-site and off-site inspections and testing;
- Reviewing plans and specification for clarity and completeness;
- Scheduling and coordinating inspection activities;
- Performing QC system audits;
- Directing and supporting the SQCO in performing observations and tests;
- Evaluating the results of the inspections and testing;
- Notifying the PM of acceptance or rejection of the work and preparing the Non-Compliance Notices, as necessary;
- Managing documentation of all inspections and testing, and supporting the SQCO in notifications to the Construction Manager and the PM through Daily Quality Control Reports; and
- Preparing Final Certification of Completion Report.

2.2.4 Construction Manager

The Construction Manager (CM) has the responsibility to construct the remedial components in strict accordance with the plans and specifications, using the necessary manpower, construction procedures, and techniques. The CM will retain responsibility and authority to direct and manage all on-site construction personnel and the equipment used in constructing the remedial components. The CM reports directly to the PM.

2.2.5 Construction Superintendent

The Construction Superintendent (CS) is the appointed manager of the project on the site. The CS is responsible for the general oversight of the progress of on-site activities, including the management of all on-site field personnel, and for implementing actions to ensure compliance with the CSMP. The CS reports to the CM.

2.2.6 Site Security Officer

The Site Security Officer (SSO) will control entry/exit of personnel and equipment to the Site during working hours. The SSO will execute and enforce the Site Security Plan. The SSO will coordinate the arrival of any outside emergency services. Unauthorized personnel will not be permitted to enter the Site. The SSO is responsible for providing Site access control, visitor documentation, and employee identification. The SSO will also be responsible for reporting and repair of broken fencing, gates, lighting, or other support zone facilities and protection of equipment and materials.

2.2.7 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) will assist and represent the Health and Safety Officer (HSO) in the implementation and enforcement of Versar's Health and Safety Plan (HSP). The SHSO will be assigned to the project on a full-time basis and will report to the HSO in matters pertaining to site safety and health. The SHSO will be responsible for the day-to-day administration of the overall program and implementation of the HSP.

Specific duties of the SHSO include, but are not limited to:

- Monitoring compliance with the HSP;
- Reviewing training and medical monitoring records for all personnel entering the Exclusion Zone to assure that they are current;
- Coordinating and conducting daily on-site safety briefings for all site personnel;
- Managing health and safety equipment (e.g., respirators, instruments, boots, gloves, suits, etc.);
- Coordinating and performing air monitoring as specified in the HSP;
- Establishing work/rest regimen in conjunction with the CS (i.e., heat stress/cold stress monitoring);
- Helping establish emergency response provisions with local authorities (e.g., hospital, fire, and police);
- Continuously monitoring health and safety conditions during the implementation of the site work;
- Maintaining site safety field logs to record air monitoring results, weather conditions, employees on-site, safety problems, and other related information;

- Reporting all incidents to the HSO;

- Stopping work if conditions are deemed unsafe; also to temporarily remove an individual from the Site if he/she is not complying with the HSP. In both cases, the SHSO will confer with the HSO and CS regarding the follow-up actions; the presence of an SHSO will not abrogate safety responsibilities of other personnel;

- Daily safety inspections of work areas; and

- Preparing daily safety reports (see Attachment 1).

2.2.8 Site Quality Control Officer

The Site Quality Control Officer (SQCO) will assist and represent the Quality Control Manager (QCM) in the implementation and enforcement of Versar's Construction Quality Control Plan (CQCP). The SQCO will be assigned to the project on a full-time basis and will report to the QCM in matters pertaining to site quality control issue. The SQCO will be responsible for the day-to-day administration of the overall QA/QC program and implementation of the CQCP.

The SQCO is the QCM's designated on-site representative and is responsible for monitoring conformance with the plans and specifications by performing the required reviews, inspections, testing, and documentation at the site. Specific duties of the SQCO include, but are not limited to:

- Monitoring compliance with the CQCP;

- Scheduling and performing inspection activities, observations, and tests;

- Notifying the QCM of acceptance or rejection of the work and preparing the Non-Compliance Notices, as necessary;

- Preparing documentation of all inspections and testing; and

- Supporting the QCM through the preparation of Daily Quality Control Reports (see Attachment 2).

2.3 Personnel Qualifications

2.3.1 General

Personnel assigned to this project will have the necessary training, education, qualifications, and experience required to perform their specific duties. The qualifications of key personnel are described in the following paragraphs.

2.3.2 Remedial Project Manager

George J. Anastos, Ph.D., P.E. is Versar's Remedial Project Manager for the Revised Remedial Action at the Enviro-Chem site. Dr. Anastos has a Ph.D. in Civil (Sanitary) Engineering and a B.S. and M.S. in Chemical Engineering. He is a registered Professional Engineer in seven states, including Indiana, and is NCEE certified. He has 27 years of experience managing large multi-year, interdisciplinary contracts that include site assessment, NEPA compliance, design, and remediation activities for federal, state, municipal, and industrial clients. He has managed more than $250 million and has been responsible for more than $500 million in remedial construction projects that include: soil vapor extraction, pump and treat, dig and haul, immediate response actions, *in-situ* and *ex-situ* bioremediation, and high and low temperature thermal treatment. He has also managed more than $300 million in federal contracts for U.S. EPA and other federal agencies.

2.3.3 Health and Safety Officer

Mark R. Brown, C.I.H., is the Health and Safety Officer (HSO) for the Revised Remedial Action at the Enviro-Chem site. Mr. Brown has a B.S. in Industrial Hygiene and has over 13 years of experience as a health and safety professional. He has provided health and safety leadership training, technical support, and hands-on manpower in a wide variety of industries and settings, including hazardous chemical handling, in-plant and transportation chemical emergency response, heavy hazardous waste site remediation, chemical process plant cleanup and demolition, laboratory (analytical and experimental), waste-related drilling operations, underground storage tank management, pilot plants, mixed wastes, lead paint abatement, and asbestos abatement, as well as high tech and heavy industries. Mr. Brown's career has provided him with significant environmental (greater than 1,000 days on site during remediation) and manufacturing (greater than 1,500 days on the shop floor) health and safety experience.

2.3.4 Quality Control Manager

David A. Basko is the Quality Control Manager (QCM) for the Revised Remedial Action at the Enviro-Chem site. Mr. Basko has a B.S. in Engineering and has over 15 years of experience in environmental consulting and remediation. For the last eight years, he has served as a Project Manager and the Quality Assurance Coordinator for Versar's Northeast Regional Business Unit. He currently manages environmental auditing projects and serves as Task

Manager on the U.S. Air Force's Environmental Compliance Assessment and Management Program (ECAMP) project. He recently managed a Toxic/Hazardous Materials contract for the U.S. Army Corps of Engineers and the U.S. EPA's Technical Enforcement Support (TES) contract for all activities in EPA Region III.

Mr. Basko has served as the QC Manager on several multi-disciplinary, multi-task projects for the U.S. EPA, the U.S. Navy, and the U.S. Army. In this capacity, he has been responsible for preparing and implementing detailed Quality Assurance Program Plans (QAPPs), as well as site-specific Quality Assurance Project Plans (QAPjPs). He has also been responsible for technical review of all project documents and for conducting internal systems audits and field procedure audits to ensure compliance with the approved project plans. He has also participated in external system audits that have been conducted by the clients.

2.3.5 Construction Manager

Charles J. Gaffney, P.O.E., is Versar's Construction Manager for the Revised Remedial Action at the Enviro-Chem site. Mr. Gaffney has a B.S. in Mechanical Engineering and 30 years of experience in project and construction management and another 12 as a mechanical engineer designing equipment and process systems for the OEM field. Mr. Gaffney has expertise in both management and design for federal, industrial, and municipal sector clients. His environmental projects include underground storage tank removal and replacement, hazardous waste field remedial action, municipal solid waste processing, and chemical waste stabilization projects. In his design capacity, he wrote Versar's *Storage Tank Design Standards Manual.* He has extensive experience with matrix management and project controls, including scheduling, estimating, cost control, and risk management.

Mr. Gaffney manages the Engineering and Construction Department of Versar's Northeast Regional Office, directing personnel in engineering, design, drafting, construction management, field oversight, and sampling for government and commercial clients. He prepares cost estimates and proposals, reviews data and reports, checks designs and specifications, and prepares subcontracts for field work.

2.3.6 Construction Superintendent/Site Security Officer

The Construction Superintendent for the Revised Remedial Action at the Enviro-Chem site is Mr. Joseph D. Borucki, P.E. Mr. Borucki has a B.S. in Engineering and over 30 years of design/construction experience for industrial/commercial, federal, and municipal clients. He has served as a Project Manager responsible for all financial budgeting and cost controls, subcontract administration, construction scheduling, contractor meetings, and quality control, and he has worked on a variety of construction and expansion projects. These construction and expansion projects have ranged from $1 to $50 million in size and 12 to 30 months in duration, and have included hazardous waste remedial construction projects, including decommissioning and decontamination of tanks and buildings with removal, transportation, and disposal activities;

general construction projects, including installation of underground drainage systems, soil excavation, installation of soil caps, transportation and disposal of hazardous waste off-site; turnkey remedial design/remedial construction projects, including permitting, scheduling, budget control, subcontractor procurement and coordination, and start-up operations; and turnkey design/build projects for a wastewater treatment plant, a water treatment plant, and miscellaneous manufacturing facilities.

2.3.7 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) for the Revised Remedial Action at the Enviro-Chem site is George R. Hartup, CHMM. Mr. Hartup has a B.S. in Environmental Health & Safety and over 20 years of experience in the field of environmental health and safety. He has been responsible for the implementation and management of all on-site safety procedures, as well as being the on-site trenching/shoring competent person for all excavations of contaminated soil, at the Harris Street Superfund site. He was also responsible for controlling all on-site personnel monitoring with site entry personnel monitoring equipment, as well as sampling and analysis of soil, sediments, surface water, and groundwater. He has also prepared health and safety plans and managed site safety during the construction of a wastewater treatment plant and has been responsible for hazardous material release response actions on a variety of projects.

Mr. Hartup is an OSHA hazardous waste operations supervisor, a Certified Hazardous Materials Manager (CHMM), and a certified instructor for OSHA. He is also certified in both CPR and first aid rescue and is a certified by the State of California as an instructor for both Hazardous Material Management and Incident Command.

Versar has also identified Mr. Mike Freeman, CHMM, as a backup SHSO in the event a second shift SHSO is needed during double-shift operations planned for the excavation of the southern concrete pad.

2.3.8 Site Quality Control Officer

The Site Quality Control Officer (SQCO) for the Revised Remedial Action at the Enviro-Chem site is Christopher J. Brown, AEP. Mr. Brown is a registered Associate Environmental Professional and is certified in the State of Indiana for underground storage tank installation, removal, and closure. He has approximately 10 years of experience as an on-site quality control manager, project superintendent, and site safety officer. He served as the on-site quality control manager on several projects for the U.S. Army Corps of Engineers, including two projects in Indiana which involved underground storage tank closure, excavation of contaminated soil, and subsequent biological treatment. His responsibilities have included supervision and management of contractors and subcontractors involved in environmental construction and remediation projects, as well as installation and maintenance of remediation systems and subsystems; installation, removal, and closure of underground storage tanks; calibration and operation of air monitoring equipment; collection, preservation, and submission of groundwater, soil, soil gas, and waste samples; and prepartion of project reports.

Versar has also identified Ray Kasaab, PG, as a backup SQCO in the event a second shift SQCO is needed during double-shift operations planned for the excavation of the southern concrete pad.

4.0 SITE SECURITY PLAN

The Site Security Plan (SSP) will be initiated during the construction and operations phase of the Remedial Action. The security procedures on the site will be under the direction of the CS. The SSP includes provisions for access control, visitor documentation, and employee identification.

The site is located on property owned by the Bankert Company. The Bankert Company maintains an 8-foot high chain link security fence which surrounds the Bankert Company property and includes the site. Entrance to the Bankert Company facility (and the site) is gained via a security gate. The CS/site security officer will be responsible for unlocking the gate each morning and locking it at the end of the work day. In addition, the CS will be responsible for assuring that the gate remains closed during non-working hours at the site.

All site workers, as well as delivery vehicles, will gain access to the Enviro-Chem site through the Bankert Company security gate. The CS will be responsible for coordinating deliveries to the site to ensure that traffic entering the security gate is not an issue. All deliveries will be scheduled so that only one delivery truck is entering the site at one time. Haul vehicles for the borrow materials will not contribute to potential traffic problems because they will not be using common access roads with the delivery vehicles and will enter the Enviro-Chem site through a different gate.

The site, inclusive of the support zone, the contaminant reduction zone, and the exclusion zone, is surrounded by a chain link security fence. In addition, lighting will be installed for added security at the site as depicted in Figure 3-1. The security lighting will be controlled by a timer. It will not be left on during weekends and holidays.

Access to the support zone, established within the fenced perimeter, is gained via the main site access gate located near the southwestern corner of the site and a second access gate located near the northwestern corner of the site that is restricted access for trucks hauling soil to/from the borrow area only. No entry into the support zone by unauthorized personnel will be permitted. All access gates into the support zone will be either locked and/or monitored to ensure only authorized personnel are permitted access. Unauthorized persons will not be permitted to enter the site. The CS will coordinate the arrival of any outside emergency services. All gates to the support zone will be locked at the end of the workday.

The CS will also coordinate the arrival of any visitors to the site. Visitors will enter the site at the main gate located near the southwestern corner of the site. A placard will be posted at the gate instructing visitors to report to the site office trailer. If necessary, a telephone or intercom may be posted at this entrance, and visitors will be instructed to contact the site office trailer upon arrival. Upon arrival at the site office trailer, visitors will be given a site safety briefing and will be required to sign the site visitor log (see Attachment 3). Visitors will not be allowed to enter the exclusion zone unless they possess proper health and safety credentials and are accompanied by an escort. At the end of their visit, visitors will be required to sign out and will be escorted off the site through the gate located near the southwestern corner of the site.

Unauthorized personnel found on the site will be reported immediately to the CS. The CS will escort the unauthorized personnel to the site office until credentials can be confirmed, escort the personnel off-site, or call local police, as appropriate.

Vandalism observed on the site will be reported to the CS. The CS will report acts of vandalism to the local authorities, and will repair or replace vandalized materials, as necessary. All equipment will be stored within the support zone at the end of the day's activities. All gates to the support zone will be locked at the end of the workday. No further security measures are anticipated.

ATTACHMENT 1

DAILY HEALTH & SAFETY REPORT FORM

DAILY HEALTH & SAFETY REPORT
ENVIRO-CHEM, ZIONSVILLE, INDIANA

Daily Report No. ______________________ Date: ______________________

SUMMARY OF DAILY SAFETY BRIEFING:

1. List Site Activities to be Performed Today:

2. Briefly Describe Any Special Chemical/Physical Hazards Discussed Associated with Today's Activities, Including PPE Levels for these Activities:

3. List Any Special Health & Safety Issues Discussed:

4. List of Attendees:

Printed Name	**Signature**

SUMMARY OF DAILY SITE ACTIVITIES AND HEALTH & SAFETY ISSUES

1. Briefly Describe Environmental/Weather Conditions (i.e., temperature, precipitation, cloud cover, wind speed, wind direction, etc.):

2. Briefly Summarize Site Operations:

3. Summarize Daily Site Worker Activities:

Worker Name	Operation(s) Performed	Time Spent on Each Operation	PPE Used for Each Operation

4. Summarize Daily Health & Safety Monitoring Activities:

Operation(s) Performed	Monitoring Equipment Used	Range (Max-Min) for Each Monitor	Average Reading for Each Monitor

5. Provide a Summary of Site Visitors (attach site visitor log and note areas/operations observed, PPE used, training/medical release status for each visitor):

Visitor Name	Areas/Operations Observed	PPE Used	Training/Medical Release Status

6. Provide General Observations Regarding Health and Safety for Each Operation:

Versar INC.

7. Summarize Health and Safety Problems Encountered:

8. Describe Resolutions to Health and Safety Problems Noted Above:

9. Briefly Describe Any Health and Safety Decisions Reached and Their Rationale:

10. Other Comments:

Versar's Verification: On behalf of Versar, I certify this report is complete and correct, and all activities performed during this reporting period are in compliance with the contract plans, specifications, health and safety plan, and applicable federal and state regulations, to the best of my knowledge, except as may be noted above.

Site Health and Safety Officer

ATTACHMENT 2

DAILY QUALITY CONTROL REPORT FORM

Versar INC.

DAILY QUALITY CONTROL REPORT
ENVIRO-CHEM, ZIONSVILLE, INDIANA

Daily Report No. ______________________________ Date: _________________________

1. Contractor/Subcontractor and Area of Responsibility:

Number	Trade	Hours	Employer: Location/Description of work

2. Operating Equipment:

Equipment	Date of Arrival/ Departure	Date of Safety Check	Hours Used	Hours Idle	Hours for Repair

3. Work Performed Today (Indicate location and description of work performed by prime and/or subcontractors.):

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4. Control Activities Performed (Identify inspections performed, results of inspections compared to specification requirements, and corrective actions taken when deficiencies are noted.):

5. Tests Performed and Test Results (Identify test requirements by paragraph number in specifications and/or sheet number in plans.):

6. Material Received (Note inspection results and storage provided.):

7. Submittals Reviewed:

Submittal No.	Spec./Plan Reference	By Whom	Action

8. Off-Site Surveillance Activities, Including Actions Taken:

9. Job Safety (List items checked, results, instructions, and corrective actions.):

10. Remarks (Include instructions received or given, conflicts in plans and/or specifications, and delays encountered.):

Versar's Verification: On behalf of Versar, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

Site Quality Control Officer

ATTACHMENT 3

SITE VISITOR LOG

Versar INC.

SITE VISITOR LOG
ENVIRO-CHEM, ZIONSVILLE, INDIANA

Name	Company	Phone Number	Date	Visitor Safety Briefing (Y/N)[1]	Time In	Time Out

[1] If the visitor requests to visit the exclusion zone, the status of the visitor's health and safety training/medical monitoring must be verified by the SHSO.

2

VERSAR'S CONSTRUCTION QUALITY CONTROL PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

PREPARED FOR:
ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

VERSAR PROJECT NUMBER 3709

FEBRUARY 1998
REVISION 2

DOCUMENT RELEASE AUTHORIZATION

This Construction Quality Control Plan has been prepared for the Environmental Conservation and Chemical Trust to ensure that quality is maintained during all construction related activities performed for the implementation of the Revised Remedial Action at the Enviro-Chem Superfund site in Zionsville, Indiana. This plan has been prepared in accordance with the requirements specified in Versar's Contract with the Trustees and the contract specifications prepared by Radian International, including Revised Exhibit A.

David A. Basko
David A. Basko
Quality Control Manager

G J Anastos
George J. Anastos, Ph.D., P.E.
Remedial Project Manager

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APPENDICES

1.0 PROJECT DESCRIPTION AND SCOPE OF WORK

1.1 Introduction

Versar's Construction Quality Control Plan (CQCP) has been developed to ensure that quality is maintained during all construction related activities performed for the implementation of the Revised Remedial Action at the Enviro-Chem Superfund site located in Zionsville, Indiana. The activities to be performed during this portion of the Revised Remedial Action construction phase are as follows:

- Abandon existing monitoring wells;
- Install wastewater storage and transfer system;
- Install wastewater and soil vapor extraction (SVE) treatment systems;
- Construct building for wastewater/SVE treatment and transfer systems;
- General site grading and excavation;
- Place excavation backfill soils;
- Install 60-mil high-density polyethylene (HDPE) liner;
- Place Stage 1 cover soils;
- Place Stage 2 cover soils and geocomposite drainage; and
- Place 12-inch vegetative soil layer.

1.2 CQCP Objectives

This document is one of the remedial design plans required by Exhibit A to the Consent Decree. This CQCP is intended to organize testing methods appropriate to construction including, at a minimum, testing of the remedial action construction materials prior to use, and testing of constructed remedial components to ensure that they meet the Contract Specifications.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 Quality Assurance/Quality Control Management Organization

Figure 2-1 presents a project organization chart which identifies the areas of responsibility and lines of authority for the remedial action construction activities. The quality assurance/quality control (QA/QC) interactions between the ECC Trust's Engineer (Engineer) and Versar are described.

2.2 Responsibilities

Responsibilities of project personnel are described in the following subsections.

2.2.1 Remedial Project Manager

The Remedial Project Manager (PM) has the primary responsibility for implementation of the project work in accordance with the project design, plans, and specifications. The PM will also provide the necessary communications interface with the following personnel:

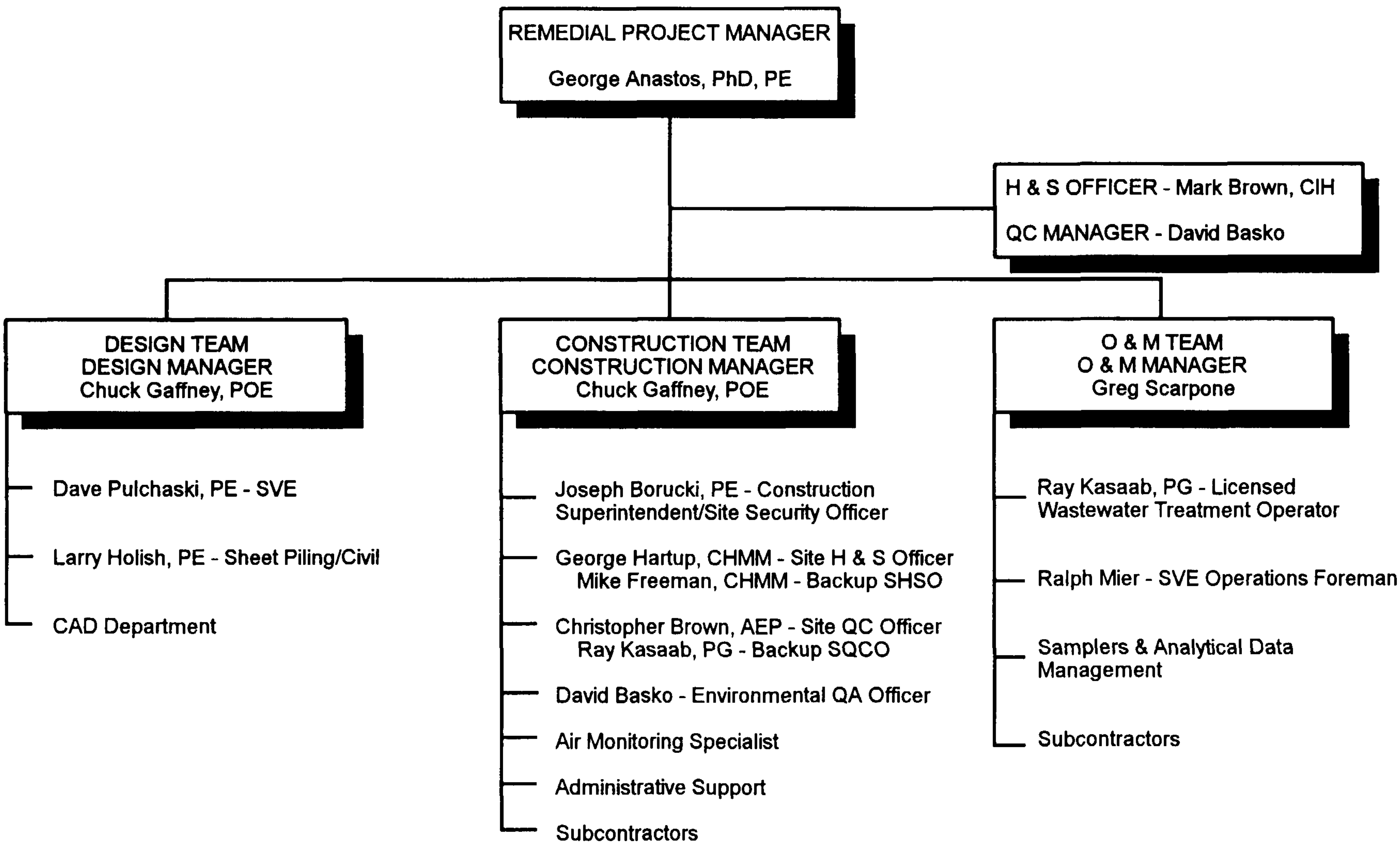
- ECC Trustees,
- Engineer,
- U.S. EPA/IDEM,
- Design Manager/Design Team,
- Construction Manager/Construction Team,
- O&M Manager/O&M Team,
- Health and Safety Officer, and
- Quality Control Manager

The PM, in the performance of his duties, will also require a staff of technical and administrative people that report directly to him. The technical staff will provide the day-to-day technical back-up as it relates to the construction activities.

The administrative staff is necessary to perform day-to-day administrative functions. These administrative functions include such activities as:

FIGURE 2-1

VERSAR/HANDEX ENVIRO-CHEM PROJECT TEAM ORGANIZATION CHART



- Tracking costs, invoices, and billing;
- Recordkeeping and filing;
- Expediting of equipment and material orders and logging receipt upon delivery; and
- Distribution of correspondence and reports.

The PM will communicate directly with the Engineer and will oversee the Construction Manager.

2.2.2 Construction Manager

The Construction Manager (CM) is a Versar employee and has the responsibility to construct the remedial components in strict accordance with the plans and specifications, using the necessary manpower, construction procedures, and techniques. The CM will retain the responsibility and authority to direct and manage his employees and the equipment used in constructing the remedial components. The CM reports to the PM. Responsibilities of the CM are outlined as follows:

- Monitor construction schedule and budget;
- Provide subcontractors to perform specific tasks;
- Purchase major equipment and materials;
- Expedite change orders; and
- Coordinate home office support staff.

2.2.3 Construction Superintendent

The Construction Superintendent (CS) has the responsibility of assuring that day-to-day activities adhere to the construction plans, designs, and specifications, as well as the construction schedule and budget laid out by the CM. The CS will be Versar's prime point of contact in the field with the authority to direct subcontractors and interface with the Engineer's U.S. EPA and IDEM on-site coordinators/representatives. Reporting responsibilities of the CS are as follows:

- Prepare the Daily Report (Section 4.5.2) and obtain approval from the Engineer;
- Maintain Submittals Register (Section 4.5.3);

- Prepare Report of Field Change (Section 4.5.6);
- Prepare Photographic Reporting Data Sheets (Section 4.5.7);
- Prepare Progress Reports (Section 6.1.1); and
- Prepare Corrective Action Reports as described in Section 5.2 of the Radian Final Design CQAP.

2.2.4 Quality Control Manager

Versar's Quality Control Manager (QCM) and the Site Quality Control Officer (SQCO) will function independent of the CM, CS, and the Engineer. The responsibility of the QCM and his designated SQCO is to perform QA/QC activities specified in this CQCP, which includes monitoring conformance to the plans and specifications by performing the necessary reviews, inspections, testing, and documentation.

The QCM is ultimately responsible for overall management of the QA/QC system and has the authority to act independently in all quality control matters. The QCM reports directly to the PM for quality control purposes only. The QCM has been designated by an official of Versar and has been delegated sufficient authority to perform the functions of this position (see Appendix A). Responsibilities of the CQC Manager are outlined as follows:

- Manage the performance of all on-site and off-site inspections and testing;
- Review of the plans and specifications for clarity and completeness;
- Schedule and coordinate inspection activities;
- Direct and support personnel in performing observations and tests;
- Evaluate the results of the inspections and testing;
- Notify the PM of acceptance or rejection of the work and prepare the Non-Compliance Notices, as necessary (Section 4.5.5);
- Manage documentation of all inspections and testing, and support the SQCO in notifications to the CM and PM through Daily Quality Control Reports; and
- Prepare Final Certification of Completion Report (Section 6.1.2).

2.3 Personnel

2.3.1 General

Personnel assigned to this project have the necessary training, education, qualifications, and experience required to perform their specific duties. The qualifications of key personnel are described in the following sections.

2.3.2 Remedial Project Manager

George J. Anastos, Ph.D., P.E. is Versar's PM for the Revised Remedial Action at the Enviro-Chem site. Dr. Anastos has a Ph.D. in Civil (Sanitary) Engineering and a B.S. and M.S. in Chemical Engineering. He is a registered Professional Engineer in seven states, including Indiana, and is NCEE certified. He has 27 years of experience managing large multi-year, interdisciplinary contracts that include site assessment, NEPA compliance, design, and remediation activities for federal, state, municipal, and industrial clients. He has managed more than $250 million and has been responsible for more than $500 million in remedial construction projects that include: soil vapor extraction, pump and treat, dig and haul, immediate response actions, *in-situ* and *ex-situ* bioremediation, and high and low temperature thermal treatment. He has also managed more than $300 million in federal contracts for U.S. EPA and other federal agencies.

2.3.3 Construction Manager

Charles J. Gaffney, P.O.E., is Versar's CM for the Revised Remedial Action at the Enviro-Chem site. Mr. Gaffney has a B.S. in Mechanical Engineering and 30 years of experience in project and construction management and another 12 as a mechanical engineer designing equipment and process systems for the OEM field. Mr. Gaffney has expertise in both management and design for federal, industrial, and municipal sector clients. His environmental projects include underground storage tank removal and replacement, hazardous waste field remedial action, municipal solid waste processing, and chemical waste stabilization projects. In his design capacity, he wrote Versar's *Storage Tank Design Standards Manual.* He has extensive experience with matrix management and project controls, including scheduling, estimating, cost control, and risk management.

Mr. Gaffney manages the Engineering and Construction Department of Versar's Northeast Regional Office, directing personnel in engineering, design, drafting, construction management, field oversight, and sampling for government and commercial clients. He prepares cost estimates and proposals, reviews data and reports, checks designs and specifications, and prepares subcontracts for field work.

2.3.4 Construction Superintendent

The CS for the Revised Remedial Action at the Enviro-Chem site is Mr. Joseph D. Borucki, P.E. Mr. Borucki has a B.S. in Engineering and over 30 years of design/construction experience for industrial/commercial, federal, and municipal clients. He has served as a Project Manager responsible for all financial budgeting and cost controls, subcontract administration, construction scheduling, contractor meetings, and quality control, and he has worked on a variety of construction and expansion projects. These construction and expansion projects have ranged from $1 to $50 million in size and 12 to 30 months in duration, and have included hazardous waste remedial construction projects, including decommissioning and decontamination of tanks and buildings with removal, transportation, and disposal activities; general construction projects, including installation of underground drainage systems, soil excavation, installation of soil caps, transportation and disposal of hazardous waste off-site; turnkey remedial design/remedial construction projects, including permitting, scheduling, budget control, subcontractor procurement and coordination, and start-up operations; and turnkey design/build projects for a wastewater treatment plant, a water treatment plant, and miscellaneous manufacturing facilities.

2.3.5 Quality Control Manager

David A. Basko is the QCM for the Revised Remedial Action at the Enviro-Chem site. Mr. Basko has a B.S. in Engineering and has over 15 years of experience in environmental consulting and remediation. For the last eight years, he has served as a Project Manager and the Quality Assurance Coordinator for Versar's Northeast Regional Business Unit. He currently manages environmental auditing projects and serves as Task Manager on the U.S. Air Force's Environmental Compliance Assessment and Management Program (ECAMP) project. He recently managed a Toxic/Hazardous Materials contract for the U.S. Army Corps of Engineers and the U.S. EPA's Technical Enforcement Support (TES) contract for all activities in EPA Region III.

Mr. Basko has served as the QC Manager on several multi-disciplinary, multi-task projects for the U.S. EPA, the U.S. Navy, and the U.S. Army. In this capacity, he has been responsible for preparing and implementing detailed Quality Assurance Program Plans (QAPPs), as well as site-specific Quality Assurance Project Plans (QAPjPs). He has also been responsible for technical review of all project documents and for conducting internal systems audits and field procedure audits to ensure compliance with the approved project plans. He has also participated in external system audits that have been conducted by the clients.

2.3.6 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) for the Revised Remedial Action at the Enviro-Chem site is George R. Hartup, CHMM. Mr. Hartup has a B.S. in Environmental Health & Safety and over 20 years of experience in the field of environmental health and safety. He has been responsible for the implementation and management of all on-site safety procedures, as well as being the on-site trenching/shoring competent person for all excavations of contaminated soil, at the Harris Street Superfund site. He was also responsible for controlling all on-site personnel monitoring with site entry personnel monitoring equipment, as well as sampling and analysis of soil, sediments, surface water, and groundwater. He has also prepared health and safety plans and managed site safety during the construction of a wastewater treatment plant and has been responsible for hazardous material release response actions on a variety of projects.

Mr. Hartup is an OSHA hazardous waste operations supervisor, a Certified Hazardous Materials Manager (CHMM), and a certified instructor for OSHA. He is also certified in both CPR and first aid rescue and is a certified by the State of California as an instructor for both Hazardous Material Management and Incident Command.

Versar has also identified Mr. Mike Freeman, CHMM, as a backup SHSO in the event a second shift SHSO is needed during double-shift operations planned for the excavation of the southern concrete pad.

2.3.8 Site Quality Control Officer

The Site Quality Control Officer (SQCO) for the Revised Remedial Action at the Enviro-Chem site is Christopher J. Brown, AEP. Mr. Brown is a registered Associate Environmental Professional and is certified in the State of Indiana for underground storage tank installation, removal, and closure. He has approximately 10 years of experience as an on-site quality control manager, project superintendent, and site safety officer. He served as the on-site quality control manager on several projects for the U.S. Army Corps of Engineers, including two projects in Indiana which involved underground storage tank closure, excavation of contaminated soil, and subsequent biological treatment. His responsibilities have included supervision and management of contractors and subcontractors involved in environmental construction and remediation projects, as well as installation and maintenance of remediation systems and subsystems; installation, removal, and closure of underground storage tanks; calibration and operation of air monitoring equipment; collection, preservation, and submission of groundwater, soil, soil gas, and waste samples; and prepartion of project reports.

Versar has also identified Mr. Ray Kasaab, PG, as a backup SQCO in the event a second shift SQCO is needed during double-shift operations planned for the excavation of the southern concrete pad.

2.3.8 ECC Trust's Engineer

The ECC Trust's Engineer (Engineer) will be the direct representative of the Environmental Conservation and Chemical Corporation Trust (ECC Trust) and will be responsible for coordinating approval of all field and design changes (Section 5.1) and communications between Versar and the ECC Trust.

The Engineer may also provide, at the discretion of the ECC Trust, construction oversight during the Remedial Action. In this role, the Engineer will provide construction activity reports in the form of progress reports and other notification to the ECC Trust.

3.0 QUALITY CONTROL OBJECTIVES

Quality control for the construction of the Remedial Action components will be maintained by planned and systematic actions which will ensure that the components conform with the project requirements and will perform satisfactorily.

The objectives of this CQCP are:

- To establish quality assurance guidelines for the construction of the Soil Vapor Extraction (SVE) and Wastewater Treatment (WWT) systems;
- To establish quality assurance guidelines for the final cover;
- To maintain quality control through standardized procedures, documentation, inspections, and reporting;
- To establish the types of inspection, testing, and sampling activities and to provide required frequency;
- To assure inspection and sampling are carried out in accordance with established quality control procedures; and
- To ensure that appropriate sampling and testing procedures are followed as outlined in Appendix B.

The quality control required for the construction will be achieved by applying field observations and material certifications supplemented by testing standards as set forth by the American Society for Testing and Materials (ASTM). The specific procedures to be followed to achieve the quality control objectives for each element of work are described in the appropriate sections of this CQCP.

4.0 CONSTRUCTION COMPONENT EXAMINATION, MEASUREMENT, AND TESTING

The adequacy of workmanship during Remedial Action construction will be determined by visual examination, measurements, certifications, and testing in accordance with standard industry practices and the requirements presented in the Technical Specifications. The extent to which each of these procedures will be employed for the final cover materials is provided in Appendix B. Testing and inspections during the SVE/WWT system construction include visual inspections, electrical testing per Radian Specification 16020, piping testing per Versar Specification 15980, and concrete testing per Radian Specifications 03200 and 03300. Testing requirements for mechanical systems are provided in Appendix B. Typical inspection report forms for various construction activities are also included in Appendix B. The relative amounts of each type of inspection will vary as the work progresses. The Engineer will perform periodic audits of Versar's protocols and implementation methodology.

Each type of inspection determines whether requirements of the plans and specifications are being met. The QCM has the authority to reject any workmanship or construction which does not meet the intent or the requirements of the plans and specifications.

4.1 Materials Inspection and Certifications

Materials used to construct the final cover, the SVE treatment system, and the WWT system will be tested by, or at the direction of, the QCM. The testing will occur before or during construction to assure compliance with the material specifications. All testing will be performed in accordance with the methods discussed in this section and the Technical Specifications and summarized in Appendix B.

Manufactured items, including the wastewater storage, transfer, and treatment systems, and the final cover geomembrane and geotextile, require manufacturer's certification verifying that those items meet the requirements of the specifications. The QCM and/or SQCO will review the data provided and visually inspect the item to assure compliance. The QCM has the authority to reject the item, require additional information in keeping with the limits of the specifications, or conduct additional inspection as may be required.

Should the testing and/or certification establish that the material, item, or workmanship is not in accordance or does not meet the requirements of the plan or specifications, the following actions will be required:

- Manufactured Items - Any manufactured item which does not meet the requirements or intent of the plans or specifications will be rejected and not used in the construction;

- Construction Materials - Any materials which do not meet the requirements or intent of the plans or specifications will be rejected and not used in the construction; and

- Workmanship - Any workmanship which does not meet the requirements or intent of the plans or specifications, or acceptable construction practice will be repaired, redone, or removed.

4.2 Measurements

4.2.1 General

The selection of sampling locations will be at the discretion and judgement of the QCM. The Stage 1 final cover soils (select material) will be tested for hydraulic conductivity in accordance with Radian Specification 02200, Part 3.06E in addition to the minimum testing requirements described below.

The intent of the inspection and sampling strategies is to evenly distribute sample and *in-situ* test locations throughout the construction unit to provide a representative measurement of as-built quality. The particular location of any one sample or inspection will be left to the discretion of the QCM. Areas not meeting design specifications will be rejected.

4.3 Cover and Backfill Materials Testing and Construction Monitoring

4.3.1 Materials Testing

Soils

For each type of soil, supply sources will be located and representative samples will be obtained for laboratory analysis to confirm their quality and suitability. The quality and suitability of soils proposed for use in the final cover system will be determined by conducting the following material quality evaluation tests on each type of material:

- Fill for general grading (suitable material)
  - Standard Proctor (ASTM D698), one per 5,000 cubic yards or each change in material type.

- Soil Cover (select material)
  - Modified Proctor (ASTM D1557), one per 5,000 cubic yards or each change in material type.
  - Sieve analysis (ASTM D422), one per 5,000 cubic yards or each change in material type.

- Moisture content (ASTM D2216), one per 2,000 cubic yards or each change in material type.
- Atterberg Limits (ASTM D4318), one per 5,000 cubic yards or each change in material type.
- Hydraulic Conductivity (ASTM D5084), one per 2,000 cubic yards or each change in material type.

- Fine Aggregate Subbase
  - Sieve analysis (ASTM D422), one per 2,000 cubic yards.

- Select Material Backfill (Southern Concrete Pad)
  - Standard Proctor (ASTM D698), one per 5,000 cubic yards or each change in material type.
  - Sieve analysis (ASTM D422), one per 5,000 cubic yards or each change in material type.
  - Moisture content (ASTM D2216), one per 2,000 cubic yards or each change in material type.
  - Atterberg Limits (ASTM D4318), one per 5,000 cubic yards or each change in material type.

  In addition, the fill and backfill materials will be sampled during the execution of the Geotechnical Plan, prior to excavation. The samples will be tested as indicated above, and a list of the fill materials, along with a sample of the material and the testing results, will be provided to the Engineer in accordance with Radian Specification 02200, Part 1.05, prior to delivery of materials to the site.

- Vegetative Layer
  - Soils classification (ASTM D2487), one per 5,000 cubic yards or each change in material type.

Geosynthetics

HDPE Liner - The manufacturer will provide the QCM with a quality control certificate for each roll of geomembrane prior to shipment. The certificate will list the roll numbers and identification, sampling procedures, and test results.

Conformance Testing - Upon arrival at the Site, the SQCO will sample the rolls of geomembrane. The sampling frequency will be 1 sample per lot or 1 sample per 100,000 square feet, whichever is less. Samples will be taken across the entire width of the roll, but not within the first 3 feet of the roll. Samples will be tested for the following properties:

- Density (ASTM D1248),
- Carbon Black Content (ASTM D1603),
- Carbon Black Dispersion (ASTM D2669),
- Thickness (ASTM D751),
- Tensile Characteristics (ASTM D638), and
- Melt Flow Index (ASTM D1238).

Geotextiles - The geotextile manufacturer will provide a letter of certification indicating the provided geotextiles meet the minimum average roll values for the specified material. Each roll will be labeled by the manufacturer with the following:

- Manufacturer's name,
- Product identification,
- Unique roll and lot number,
- Roll dimensions, and
- Any special handling requirements.

Conformance Testing - Upon arrival at the Site, the SQCO will sample the rolls of geotextile. The sampling frequency will be 1 sample per lot or 1 sample per 100,000 square feet, whichever is less. Sampling locations vary by test, but are not within the first 3 feet of the roll. The size of the sample will be 3 feet by the width of roll. Samples will be tested for the following properties:

- Mass per unit area (ASTM D3776),
- Permittivity (ASTM D4491),
- Apparent opening size (ASTM D4751),
- Grab strength (ASTM D4632),
- Trapezoidal tear strength (ASTM D4533),
- Puncture strength (ASTM D4833),

- Thickness (ASTM D1777), and
- Burst strength (ASTM D3786).

4.3.2 Construction Monitoring

Soils Placement

The following construction quality evaluation tests will be performed on each type of soil material:

- Fill for General Grading (suitable material)
  - Nuclear density meter (ASTM D2922), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing a sand cone (ASTM D1556) for a minimum of 1 per every 20 ASTM D2922 tests.
  - Moisture content (ASTM D3017), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.
  - Continuous visual observation and inspection will be performed. Special attention will be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift; and desiccation cracking of the lift caused by drying.
- Soil Cover (select material)
  - Nuclear density meter (ASTM D2922), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing sand cone (ASTM D1556) for a minimum of 1 per every 20 ASTM D2922 tests.
  - Moisture content (ASTM D3017), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another

suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.

- Continuous visual observation and inspection will be performed. Special attention will be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift; and desiccation cracking of the lift caused by drying.

▸ Fine Aggregate Subbase

  - The wastewater storage tank subbase fine aggregate will have continuous visual inspection while being spread before being compacted by dry vibratory rolling. Lift depth checks on placed material will be conducted for a minimum of 5 per acre.

▸ Select Material Backfill (Southern Concrete Pad)

  - Nuclear density meter (ASTM D2922), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing sand cone ASTM D1556 for a minimum of 1 per every 20 ASTM D2922 tests.

  - Moisture content (ASTM D3017), 5 per acre per lift. Questions concerning the accuracy of a single test will be addressed by retesting at that or another suitable location. The accuracy of the nuclear testing equipment will be verified by utilizing moisture content (ASTM D2216) for a minimum of 1 per every 10 ASTM D3017 tests.

  - Continuous visual observation and inspection will be performed. Special attention will be given to the condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of the compaction equipment on the lift surface; the number of equipment passes required to compact each lift, and desiccation cracking of the lift caused by drying.

- Topsoil for vegetation layer

  - Top soil layer will be continuously visually inspected while being spread. A minimum of five lift depth checks will be made per acre.

- Field Surveys

  - Field surveys will be performed to assure proper lift and total layer thicknesses, and construction at the proper locations and elevations. Survey data will be collected at points a maximum of 50 feet apart, or a minimum of six points per lift, and at any critical location. Survey data will meet a maximum tolerance of ±0.10 feet horizontally and vertically.

Geosynthetic Installation

HDPE Liner

- Personnel performing seaming operations will be qualified by experience or by successfully passing seaming tests. At least one seamer will have experience seaming a minimum of 1,000,000 ft^2 of HDPE geomembrane using the same type of seaming equipment that is used at the site;

- Versar will provide the Engineer with a list of proposed seaming personnel and their professional records. Proposed personnel deemed sufficiently inexperienced will not be accepted by the Engineer;

- Test seams will be made on pieces of geomembrane liner to verify that seaming conditions are adequate. Test seams will be made at the beginning of each seaming period and at least once each 4 manhours for each seaming apparatus used that day. Each seamer will make at least one test seam each day;

- Test seam samples will be at least 2 feet long and 1 foot wide with the seam centered lengthwise. Two adjoining specimens 1 inch wide will be cut from the test seam sample. These specimens will be tested in the field in shear and peel, respectively, by hand or tensiometer, and will not fail in the seam. If a test seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be accepted or be used for seaming until two consecutive successful test seams are achieved;

- Versar will nondestructively test all field seams over their full length using a vacuum test unit or air pressure (fusion process). Testing will be done as the work progresses, and not at the completion of all field seaming;

- Locations where seams cannot be nondestructively tested will be observed by the CS and SQCO for uniformity and completeness;

- Vacuum testing procedures and requirements consist of the following:

  - Vacuum testing will be conducted by utilizing a steel box with a clear-view glass top, a rubber gasket on the open bottom perimeter, a pressure gauge on the inside, and a vacuum hose connection to a steel vacuum tank and pump assembly equipped with a rubber pressure/vacuum hose with fittings and connections.

  - The box will be placed over a seam section that has been thoroughly saturated with a soapy water solution. The rubber gasket on the bottom perimeter of the box will fit snugly against the soaped seam section of the liner.

  - When 3 to 5 inches of vacuum is achieved, the seam will be inspected for pinholes, porosity, or nonbonded areas. Test time will be a minimum of 30 seconds per test section.

  - If a void is detected, it will be properly marked for subsequent repairs.

- Air pressure testing procedures and requirements are as follows:

  - An air pump will be equipped with a pressure gauge capable of generating and sustaining 25 to 30 psi pressure, a hose, fittings and connections, and a sharp needle or approved alternate device.

  - Seams will be sealed. The needle will be inserted in the cavity created by the fusion weld, and 25 to 30 psi pressure will be applied for 5 minutes.

  - The seam will be inspected for defects, pinholes, porosity, and nonbonded areas.

  - If a void is detected, it will be marked and repaired.

- Destructive seam testing will be performed as follows:

  - Location and Frequency

    - No less than an average of one test will be conducted per 500 feet of seam length or per day, whichever is greater.

- Additional test locations will be determined during seaming at the discretion of the CS and SQCO. Selection of such additional locations will be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.

- Contractor personnel will not be informed in advance of the locations where the seam samples will be taken.

\- Sampling Procedures

- Samples will be cut at locations designated by and under the observation of the SQCO in order to obtain laboratory tests results prior to completion of liner installation. Each sample will be numbered, and the sample number and location will be identified on the panel layout drawing.

- Holes in the geomembrane resulting from destructive seam sampling will be immediately repaired. The new seams in the repaired area will be nondestructively tested.

\- Size of Samples

- Samples will be 12 inches wide by 38 inches long with the seam centered lengthwise. One 1-inch wide strip will be cut from each end of the sample, and these strips will be tested in the field, by hand or tensiometer, for shear and peel, respectively and will not fail in the seam. The remaining sample will be cut into three equal parts (minimum 12 inches each) and distributed as follows:

  - One portion for the Contractor's independent laboratory testing (12 inches by 12 inches);

  - One portion for the QCM's independent laboratory testing (12 inches by 12 inches); and

  - One portion for the QCM for archive storage (12 inches by 12 inches).

\- Contractor's Laboratory Testing

- Test results from the Contractor's independent laboratory will be submitted to the Engineer as soon as they become available.

- Procedures for Destructive Test Failure

  - The following procedures will apply whenever a sample fails the field destructive test or the laboratory test (Contractor's independent or QCM's independent laboratory):

    - Contractor will reconstruct the seam between the failed location and any passed test locations;

    - Contractor will retrace the welding path to an intermediate location (at a 20-foot minimum from location of a failed test) and take a small sample for an additional field test. If this additional sample passes the test, the seam will be reconstructed between that location and original failed location. If this sample fails, the process will be repeated;

    - In any case, all acceptable seams will be bounded by two passed test locations in both directions, and one sample for destructive testing will be taken within the reconstructed area; and

    - Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and welding apparatus or welding during the same time shift.

Geotextiles - The SQCO will ensure that the geotextile separate sheets are indeed sewn together with a minimum of 4-inch overlap. The SQCO will lightly tug on the seams at various locations to verify that all seams have indeed been sewn, and the stitch is at least as strong to the pull as the fabric itself. The SQCO will notify the QCM of any problems.

All holes or tears in the geotextile will be repaired by patching with the same geotextile. The patch will be a minimum of 12 inches larger in all directions than the area to be repaired and will be sewn into place. On slopes steeper than 20 percent, the patch may not be placed any closer than 1 inch (25 mm) from any edge. If a roll has a tear which exceeds 10 percent of the width of the roll, that portion of the roll will be removed and replaced.

The SQCO will observe all repairs and verify that each conforms with the above procedures. The SQCO will notify the QCM and the CM of any problems or deviations from the specified procedures.

The cover material will be placed in such a manner to assure that the geotextiles are not damaged. Care will be taken to minimize any slippage of the geotextile and to assure that no tensile stress is induced in the materials.

4.3.3 Geocomposite Drainage Net

Manufacturers Documentation

Prior to delivery, the Geocomposite Drainage Net Manufacturer will provide documentation which demonstrates that the material properties of the material meet design requirements. Delivered rolls of geocomposite drainage net will be appropriately labeled.

Certification of Material Properties

Prior to the installation of any geocomposite, the Geocomposite Manufacturer or Installer will provide the CS with the following information:

- The origin (supplier's name and production plant) and identification (brand name and number) of the geotextile and HDPE drainage net used to fabricate the geocomposite; and

- Copies of dated quality control certificates issued by the geotextile and HDPE drainage net supplier. These certificates will contain the results of the quality control tests performed on the geocomposite components as outlined in this CQCP.

The Geocomposite Drainage Net Manufacturer will provide the CS with a list of guaranteed "minimum average roll value" properties (as defined by Radian International) for the type of geocomposite drainage net to be supplied. The Geocomposite Drainage Net Manufacturer will provide the CS with a written certification signed by a responsible party that the geocomposite drainage net actually delivered has properties which meet or exceed the guaranteed "minimum average roll values" properties.

The SQCO will examine the Manufacturer's certifications to verify that the property values listed on the certifications meet or exceed the Manufacturer's guaranteed minimum values and the design specifications. Deviations will be reported to the CS and CM.

Labeling

The Geocomposite Drainage Net Manufacturer will identify all rolls of geocomposite drainage net. Each roll will have a weatherproof label which contains the following:

- Manufacturer's name,

- Product identification, and

- Roll dimensions.

In addition, if any special handling of the geocomposite drainage net is required, it will be so marked on the top surface of the geotextile (e.g., "This Side Up").

The SQCO will examine rolls upon delivery, and any deviation from the above requirements will be reported to the CS and CM.

4.3.4 Shipment and Storage

During shipment and storage, the geocomposite drainage net will be protected from ultraviolet light exposure, precipitation, snow, or other inundation, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions. Rolls will be wrapped in plastic sheets or otherwise protected. Wrappings protecting the rolls will be removed less than 1 hour prior to unrolling the geocomposite drainage net.

Geotextiles/geonet composites will not be exposed to precipitation prior to being installed. Wet geotextiles/geonet composites are heavy, which makes them difficult to deploy and can also effect liner welding when the geomembrane is adjacent to the geotextile. During cold weather, geotextiles/geonet composites will be protected from freezing.

The SQCO will observe rolls upon delivery and prior to installation. Any deviation from the above requirements will be reported to the CS and CM. Any damaged rolls will be rejected and replaced at no cost to the Owner.

4.3.5 Conformance Testing of Geocomposite Drainage Nets

Prior to the deployment of the rolls, the SQCO will remove and forward samples to the Geosynthetics QA Laboratory for testing to verify conformance with the test methods and values presented in Appendix B.

Sample Collection

Using the packing list provided by Manufacturer or a sequential inventory list made by the SQCO, rolls will be selected for sampling at a minimum frequency of 1 sample per 100,000 square feet (9,000 m^2) of material. If the material is shipped in identifiable lots or manufacturing runs, sample selection will be adjusted to assure that the minimum frequency is met and that each different lot or manufacturing run is represented by at least one sample. If a roll is not identifiable by roll number, the SQCO will inform the CS immediately. If the roll cannot be tracked, the CS will reject the roll.

Samples will be taken across the entire width of the roll and will not include the first 3 lineal feet (1 m). Unless otherwise specified, samples will be 3 feet (1 m) long by the roll width. The SQCO will mark the machine direction on the samples with an arrow.

Test Results

The results of the conformance testing will be evaluated in accordance to the following procedure:

- If the average test values for the sample meet all of the values given in the design specifications and the Manufacturer's guaranteed minimum values, the sample passes;

- If the average test value for the sample does not meet one or more of the required values, additional evaluation procedures will be implemented by the SQCO. Additional tests required for further evaluation will be done at no expense to the Owner and will proceed as follows.

  - For the failing parameter(s), two additional tests will be performed on the sample. These tests may be performed by another Geosynthetics QA Laboratory at the discretion of the SQCO and the CM.

  - If the average test values for each of the two additional tests meet the required values, the roll and adjacent rolls pass and are acceptable.

  - If one or more of the average test values do not meet requirements, the roll will be rejected, and samples will be collected from the closest numerical roll on both sides of the failed roll. These samples from the closest numerical roll will be tested for the failed parameter(s). If one or both of these tests do not meet requirements that (those) roll(s) will be rejected, and the SQCO and CM will determine further testing protocol and criteria for identifying the limits of rejected rolls.

4.3.6 Handling and Placement

The Installer will handle geotextiles/geonet composites in such a manner as to minimize damage and will comply with the following:

- On slopes, the geocomposite will be securely anchored and then rolled down the slope in such a manner as to continually keep the geocomposite sheet in tension. If necessary, the geocomposite will be positioned by hand after being unrolled to minimize wrinkles;

- In the presence of wind, all geocomposites will be weighted with sandbags filled with fine grained material or the equivalent. Sandbags will be installed during deployment and will remain until replaced with cover material;

- Unless otherwise specified, single-sided geocomposite will not be welded to the geomembrane;

- Geocomposites will be cut using a hook blade or other tool approved by the CS. If in place, special care will be taken to protect underlying geosynthetics from damage that could be caused by the cutting of the geocomposite. Care will be taken not to leave the tools in the geocomposite;

- The Installer will take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite;

- During placement of geocomposite, care will be taken not to entrap, in or beneath the geocomposite, stones or dirt that could damage the geomembrane, cause clogging of drains or filters, or hamper subsequent seaming; and

- A visual examination of the geotextile component of the geocomposite will be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects are present.

The SQCO will note any noncompliance and report it to the CS and CM.

4.3.7 Seams and Overlaps

In general, no horizontal seams will be allowed on sideslopes. Consequently, seams will be along, not across, the slope, except as part of a patch. If horizontal seams are required, adjacent horizontal seams will be offset.

At a minimum, the following requirements will be met:

- Adjacent geocomposite will be overlapped so that the HDPE drainage net overlaps by at least 6 inches (150 mm) and the geotextile of the geocomposite overlap by at least 3 inches (75 mm);

- The HDPE drainage net of the geocomposite will have overlaps and will be tied with plastic fasteners. Tying devices will be white or yellow for easy inspection. Metallic devices will not be allowed. If self-locking plastic tie wraps are used, the locking joint will be set within the rib to prevent damage to adjacent materials;

- Tying will be every 5 feet (1.5 m) along the slope, every 6 inches (150 mm) in the anchor trench, and every 6 inches (150 mm) along end-to-end seams on the base of the fill;

- In the corners of the sideslopes where overlaps between perpendicular strips are required, an extra layer will be unrolled along the slope, on top of the previously installed geocomposite, from top to bottom of the slope;

- When more than one layer of geocomposite is installed, joints will be staggered;

- Once HDPE drainage net is tied, the geotextile of the geocomposite will be seamed. The Installer will pay particular attention to seams to ensure that no earth cover material could be inadvertently inserted beneath the geotextile, if applicable; and

- Any sewing will be done using polymeric thread with physical, chemical, and ultraviolet light resistance properties equal to or exceeding those of the geotextile. Sewing will be done using machinery and stitch types specified in the project specifications, or as approved in writing by the CM and the SQCO.

The SQCO will note any deviation and report it to the CS and CM.

4.3.8 Repair Procedures

The final decision as to the appropriate repair will be agreed upon between the CS, Installer, and SQCO. Prior to acceptance of the geocomposite, the Installer will locate and repair all damaged areas as directed by the SQCO. Care will be taken to remove any soil or other material which may have penetrated the torn geotextile. The SQCO will observe any repair and report any noncompliance with the following requirements, in writing, to the CS.

If in the SQCO's judgement, the defect is determined to be small, typically smaller than 3 feet x 3 feet (1 m x 1 m), the geocomposite will be repaired as follows:

- If the HDPE drainage net is judged to be undamaged but the geotextile is damaged, a patch of geotextile will be placed. The geotextile patch will be sewn in place with a minimum 24-inch (0.6 m) overlap in all directions; and

- If the HDPE drainage net is judged to be damaged, the damaged HDPE drainage net will be removed. A section of HDPE drainage net will be cut to replace the removed section. The HDPE drainage net will be tied to the existing HDPE drainage net using white plastic fasteners placed at least every 6 inches (150 mm) of overlap. A geotextile patch will be placed over the repaired HDPE drainage net section. The geotextile patch will be thermally bonded in place with a minimum 12-inch (0.3 m) overlap in all directions.

If the hole or tear width across the roll is more than 50 percent of the width of the roll, the damaged area will be cut, and the two portions of the geocomposite drainage net will be joined as indicated in Section 4.3.7.

The SQCO will observe any repair, note any deviation with the above requirements, and report them to the CS and CM.

4.3.9 Placement of Materials on Geocomposite Drainage Nets

The Installer will place materials on the geocomposite drainage net in the following manner:

- Cause no damage to the geocomposite drainage net and underlying geosynthetics;
- Allow minimal slippage of the geocomposite drainage net on underlying layers;
- No excessive stresses in the geocomposite drainage net;
- Equipment used for placing the overlying material will not be driven directly on the geocomposite drainage net;
- A minimum thickness of 1 foot (30 cm) of soil will be maintained between light, low ground pressure equipment (such as a wide pad Caterpillar D-6 or lighter) and the geocomposite drainage net;
- A minimum thickness of 1.5 feet (45 cm) of soil will be maintained between rubber-tired vehicles and the geotextile, unless approved by the Design Engineer and CM; and
- In heavily trafficked areas, such as access ramps, soil thickness will be at least 3 feet (1 m).

Any deviation will be noted by the SQCO and reported to the CS and CM.

4.3.10 Erosion Control Revetments

The Fabrications Manufacturer will provide materials certification that the properties of the material meet manufacturer's specification. The fabric forms manufacturer will provide the CS with a list of guaranteed minimum properties (as defined by the Technical Specifications). The fabric form manufacturer will provide the CS with written certification signed by a responsible party that the fabric forms actually delivered have properties which meet or exceed the guaranteed properties.

The SQCO will examine the manufacturer's certification to verify that the material properties listed on the certifications meet or exceed the manufacturer's guaranteed minimum values and the design specifications. Deviations will be reported to the CS and CM.

Shipment and Storage

During shipment and storage, the fabric forms will be protected from ultraviolet light, precipitation, snow, mud, dirt, dust, puncture, cutting, or any other damaging or deterious conditions.

The SQCO will observe rolls upon delivery and prior to installation. Any deviations from the above requirements will be reported to the CS and CM. Any damaged mats will be rejected and repaired at no cost to the Owner.

Handling: Placement and Installation

The Installer will handle the Fabriform Filter Revetment panels in such a manner as to minimize damage and will comply with the following:

- The Installer will handle the Fabriform mats in such a manner as to ensure they are not damaged;
- In the presence of wind, all Fabriform mats will be sufficiently secured to prevent their movement prior to filling;
- During placement, care will be taken not to entrap stones or moisture under the fabriform. Care will be taken not to walk on or drag equipment across the fabriform during filling operations;
- Prior to final aggregate concrete injection, the fabriform will be positioned over a geotextile filter fabric as specified by the Engineer's Technical Specifications . Care will be taken to assure appropriate allowance for contraction of the fabric, which will occur as a result of final aggregate concrete injection; and
- Fabric mats may be factory assembled in predetermined sizes and joined together side-by-side at the job site by field screening or by means of zipper closures attached to the upper and lower layers of fabric. If joining of mats, as described above, is impractical, adjacent mats will be overlapped a minimum of two feet, subject to Engineer's approval. In no case will simple butt joints between mats be allowed.

Slope Preparation

The surfaces to be protected will be prepared and grated as specified by the Engineer. Revetments will be placed over relatively smooth surfaces. Anchor and trenching will be in accordance with project work plans and specifications.

Final Aggregate Concrete Injection

Following placement of the Fabriform mats over the geotextile filter, a final aggregate concrete (see Engineer's Specifications) will be injected between the top and bottom layers of fabric through designated fill ports in the upper layer of fabric. The injection pipe will be wrapped tightly at the point of injection with a strip of burlap during pumping.

The sequence of final aggregate concrete injection will be such as to insure complete filling of the revetment fabric to the thickness specified by the manufacturer:

- During concrete injection, the mat thickness will be measured by inserting a short piece of stiff wire through the crowns of the mat, midway between filter points, at several locations from the crest to the toe of the slope. Any mat measuring less than 90 percent of the average of all thickness measurements will be reinjected until average thickness has been attained; and

- The upper portion of the fabric form, which has been placed in the anchor trench, will be filled first, followed by concrete injections into the lower edge, work back up the slope. Care will be taken not to over pressure the fabriform mats.

Excessive final aggregate concrete, which has been inadvertently spilled on the mat surface, will be removed as soon as practical. A broom and shovel will be used for this purpose. The use of water for cleaning is strictly prohibited.

To prevent improper curing of final aggregate concrete, only the amount of fabriform mats that can be anchored, inspected, repaired, and protected in the same day will be installed.

Continuous visual observation and inspection will be performed by the SQCO for uniformity and completeness during the installation and filling processes.

4.4 Existing Monitoring Well Abandonment

Abandonment of the existing monitoring wells that are located within the area to be capped will be completed in accordance with the following procedures:

- The depth of each well will be measured, ensuring that there are no obstructions in the borehole;

- A 1-foot deep hole will be excavated around each well. The concrete seal around the upper foot of casing will be removed, and the exposed upper foot of casing will be cut off;

- A mixture of neat cement and bentonite will be tremied into the borehole, beginning at the base of each borehole. The grout mixture will be prepared using one sack of portland cement, 7 gallons of water, and 5 pounds of bentonite powder;

- Grout will be tremied to the top of the cut-off casing;

- A 6-inch bentonite pellet seal will be placed on top of the borehole and will fill the entire dug hole surface area;

- The remaining space in the dug hole with be finished with grout mixture with sloped sides from the center of the borehole; and

- All abandonment procedures will be documented.

Continuous visual observation and inspection will be performed by the Versar's registered hydrogeologist during well abandonment procedures. The cement bentonite mixture will comply with specifications for well seals in Section 56.000 of the U.S. EPA Manual of Water Well Construction Practices. The cement bentonite mixture will be injected at a pressure of at least 50 psi greater than the normal hydrostatic pressure of the water column at the base of each well. Tremie grouting will continue until enough grout has been introduced to account for the volume of the well casing, the annular space around the casing, and a minimum of ten additional lineal feet of casing. A summary report will be prepared and issued detailing the results of the well abandonment procedures.

4.5 Quality Control Documentation

4.5.1 General

This CQCP will not be effective unless all critical construction activities that should be inspected are designated, and personnel are assigned to each inspection task by the QCM. This is accomplished by using standardized documentation forms covering the anticipated items that are to be inspected. The following reports and records will be prepared by the individuals indicated with distribution as noted. Appendix C provides the forms and logs required for documentation of the QC activities. Table 4-1 summarizes the various submittals required by this CQCP.

Table 4-1. Construction Quality Control Plan Submittal List

Submittal	Preparer of Submittal	Recipient of Submittal	Schedule of Submissions
Daily Report	Construction Superintendent	Construction Manager, Quality Control Manager, Project Manager, and Engineer	Daily
Submittals Register	Construction Superintendent	Construction Manager, Quality Control Manager, Project Manager, and Engineer	Weekly
Daily QC Reports	Site Quality Control Officer	Construction Manager, Quality Control Manager, Project Manager, and Engineer	Daily
Noncompliance Notification	Site Quality Control Officer	Construction Manager, Project Manager, and Engineer	Per occurrence
Report of Field Change	Construction Superintendent	Construction Manager, Quality Control Manager, Project Manager, and Engineer	Per occurrence
Well Abandonment Summary Report	Construction Superintendent	Quality Control Manager, Project Manager, and Engineer	At completion of work
Manufacturers' and Suppliers' Material Certification with CQC Transmittal Form	Site Quality Control Officer	Construction Manager and Engineer	Daily with first shipment of material
Corrective Actions Report	Construction Superintendent	Construction Manager, Project Manager, and Engineer	As necessary
Photographic Reporting Data Sheets	Construction Superintendent	Project Manager and Engineer	At completion of work
Progress Reports	Construction Manager	Project Manager and Engineer	Monthly
Final Certification of Completion	Quality Control Manager	Engineer, ECC Trust, U.S. EPA, and IDEM	At completion of work

4.5.2 Daily Report

A daily written summary report will be prepared by the CS. This report provides a chronological framework for identifying and recording all other reports and aids in tracking what was done and by whom. As a minimum, the daily summary reports will contain the following information:

- Unique identifying sheet number for cross-referencing and document control;
- Date, project name, location, construction activities, personnel involved in major activities, and other relevant identification information;
- Description of weather conditions, including temperature, cloud cover, and precipitation;
- Summaries of any meetings held and actions recommended or taken;
- Specific work units and locations of construction underway during that particular day;
- Equipment and personnel being utilized in each unit process, including subcontractors; and
- Signature of CS.

All of the daily inspection data sheets will be numbered sequentially and attached to this report. The original will be filed with the CM, and copies will be sent to the Engineer, the QCM, and the PM. A permanent and complete record of this information will be kept at the project site.

4.5.3 Submittals Register

The Submittal Register provides a record of all submittals and transmittals related to materials and construction. Examples of items to be recorded include construction drawings, shop drawings, samples, certifications, and test data. The CS will maintain this register, numbered sequentially, and will send copies to the Engineer, the QCM, the CM, and the PM.

4.5.4 Daily Quality Control Reports

Daily quality control reports will be prepared to document the inspections and field tests for the principal operations incorporated in the construction of the Final Cover components. Appended to these reports will be recorded pertinent observations in the form of notes, charts, sketches, photographs, or any combination of these. The original (or copy) will be filed by the QCM with copies sent to the Engineer, the PM, the CS, and the CM.

All observations, results of field tests, and results of laboratory tests performed on-site or off-site will be recorded on a suitable data sheet. Recorded observations will include notes, charts, sketches, photographs, or any combination of these.

At a minimum, the inspection data sheets will include the following information:

- Unique identifying sheet number for cross-referencing and document control;
- Description or title of the inspection activity;
- Location of the inspection activity, or location from which the sample was obtained;
- Description of off-site material received, including any quality control data provided by the supplier;
- Calibrations, or recalibrations, of test equipment, including actions taken as a result of recalibration;
- Decisions made regarding approval of units of material or of work, and/or corrective actions to be taken in instances of substandard or suspect quality;
- Unique identifying sheet numbers of inspection data sheets and/or problem reporting and corrective measures used to substantiate any QA/QC decisions described in the previous item;
- Type of inspection activity and procedure used (reference to standard method, when appropriate, or specific method described in the CQCP);
- Recorded observation or test data, with all necessary calculations;
- Results of the inspection activity (e.g., pass/fail); comparison with specification requirements;
- Personnel involved in the inspection besides the individual preparing the data sheet; and
- Signature of the SQCO.

4.5.5 Non-Compliance Notifications

Non-compliance notifications will be prepared to document problems encountered and the corrective measures taken to alleviate the problem. The problems may relate to materials or workmanship that does not meet the plans and specifications. Notifications will be prepared as necessary by the SQCO. The original will be filed by the QCM, with copies sent to the Engineer, the CM, the CS, and the PM.

A problem is defined as material or workmanship that does not meet the requirements of the plans, specifications, or this CQCP, or any obvious defect in material or workmanship. Non-compliance notifications will contain the following information:

- Unique identifying sheet number for cross-referencing and document control;
- Location of the problem;
- Description of the problem in as much detail as possible and with supporting sketches or photographic information, where appropriate;
- Probable cause;
- How and when the problem was located (reference to inspection data sheet or daily summary report by the SQCO);
- Where relevant, estimation of how long the problem has existed;
- Any disagreement noted by the inspector between the inspector and contractor about whether or not a problem exists or the cause of the problem;
- Suggested corrective measure(s);
- Documentation of correction, if corrective action was taken and completed prior to finalization of the non-compliance report;
- Where applicable, suggested methods to prevent similar problems or recurrence; and
- Signature of the SQCO.

4.5.6 Report of Field Change

A report indicating changes to the originally specified construction will be prepared by the CS, which will describe, in detail, the recommended change or changes that were made. Indication will be made as to whether this was an isolated case or general condition which will affect or change additional work or future specifications and drawings. The original will be filed with the CM, with copies sent to the PM, the QCM, and the Engineer.

4.5.7 Photographic Reporting Data Sheets

A pictorial record of the work progress, problems, and corrective measures will be handled through the Photograph Documentation Plan prepared by the CS for the final cover. Photographs will be identified as to the roll number, the frame number, the date, and the project, and will be geared toward Physical Component documentation. Videotaping will be identified as to the cassette number, counter position or time elapsed, the date, and the project, and will be geared toward construction activities. A description will be included on pertinent objects in the photograph identified and recorded. The negatives will be filed in the order taken and stored separately from the photographs. A data sheet, numbered sequentially, will be filed with the Engineer at the completion of the work, with copies to the PM. Two prints of photographs will be obtained, one set for the Engineer and the other set for the PM.

4.5.8 QC Transmittal Form

A standard QC transmittal form will be used when submitting any type of QC documentation. The transmittal form will be used by all parties involved with the Enviro-Chem Site construction QA.

4.5.9 Storage of Records

During the construction, the CS will be responsible for all construction documents, including originals of reports and data sheets described in this section. Duplicates will be stored with the Engineer.

The documentation will be maintained throughout the construction period and the initial performance evaluation monitoring period. After the performance evaluation period is completed and all "fine-tuning" or modification of the remedial action has been carried out, the CS will transfer a copy of his file to the Engineer.

5.0 FIELD CHANGES AND CORRECTIVE ACTION

5.1 Field and Design Changes

Once under construction, site conditions are likely to be encountered that may require some alterations or adjustment of the design as presented in the plans and specifications. Such field changes, when necessary, will be implemented according to the following criteria:

- Minor changes, such as adjusting the position of an item, will be recorded on a set of prints (i.e., as-builts) that will be kept by the CS;
- Changes in the design, such as an adjustment of the material specifications, exact location, and method of installation of sheet piling, or size of a component, will require the approval of the CM, the PM and the Engineer; and
- Major changes will require approval of the PM, the Engineer, the U.S. EPA, and IDEM.

Changes in the basic design will require a Report of Field Change and will be approved by Engineer. Major design changes will be made only with written agreement of the Engineer and will be adjusted within the Technical Specifications.

5.2 Construction Problem and Corrective Actions Report

Reports describing special construction situations, as required by the Engineer, will be prepared by the CS and approved by the CM and cross-referenced to specific observation logs and test data sheets. These reports will include the following information:

- An identifying sheet number for cross-referencing and document control;
- A detailed description of the situation or deficiency;
- The location and probable cause of the situation or deficiency;
- How and when the situation or deficiency was found or located;
- Documentation of the corrective action taken to address the situation or deficiency;
- Final results of any responses;

- Any measures taken to prevent a similar situation from occurring in the future; and

- The signature of the SQCO, Engineer, CS, CM, and PM indicating concurrence.

The PM will be made aware of any significant recurring non-conformance with the design specifications by the Engineer. The PM will then determine the cause of the non-conformance and recommend appropriate changes in procedures or specifications to the Engineer. These changes will be submitted to the Engineer for approval, if necessary.

6.0 QUALITY CONTROL REPORTS TO MANAGEMENT

6.1 Construction Activity Reporting

The Engineer will prepare periodic reports for the ECC Trust which summarize construction activities and the results of observations and tests. Progress reports will be prepared at selected time intervals to document the status of the work. Certifications will be prepared at the completion of major construction activities.

At the completion of the work, final documentation will be prepared and will include supporting field and laboratory test results.

6.1.1 Progress Reports

The CM will prepare CQA Progress Reports and submit them to the PM and the Engineer. A CQA Progress Report will be submitted upon completion of each major construction component identified in Section 1.1 of this CQCP. At a minimum, these reports will include the following information:

- A unique identifying sheet number for cross-referencing and document control;
- The date, project name, location, and other information;
- A summary of work activities during the progress reporting month;
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting month;
- A summary of test results, failures and retests; and
- The signature of the SQCO, CS, and CM.

The PM will distribute copies of the Progress Reports to the Engineer.

6.1.2 Final Certification of Completion

At the completion of the work, Versar's QCM will submit to the ECC Trust, U.S. EPA, and IDEM the signed Final Certification of Completion. At a minimum, the Final Certification of Completion will include:

- Summaries of all construction activities;

- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results;
- Construction problems and solutions reports;
- Changes from design and material specifications;
- Record plans; and
- A summary statement signed by the CS, SQCO, CM, and PM that agrees with the conclusions of the Final Certification of Completion.

APPENDIX A

LETTER DESIGNATING AUTHORITY TO VERSAR'S QUALITY CONTROL MANAGER

Versar INC.

November 14, 1997

Trustees of the Enviro-Chem Trust Fund:

R.O. Ball, Ph.D., P.E.
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Norman W. Bernstein, Esq.
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Washington, D.C. 20036
(202) 466-8100

Re: Revised Remedial Action (RRA) at the Enviro-Chem Site, Zionsville, Indiana Designation of Authority to Versar's Quality Control Manager(CQCM)

Dear Trustees:

Versar, Inc. is committed to providing quality construction services above industry standards. Our corporate quality goal is zero defects, and we have committed our corporate resources to achieving this goal on the Enviro-Chem RRA project. Mr. David A. Basko has the authority to perform the functions of the CQCM, which includes the following:

1. Implement the corporate quality control program;
2. Track corrective actions/non-conformances;
3. Interface with the Trustee's and Radian regarding the quality control program;
4. Coordinate quality control training;
5. Schedule and conduct quality control audits;
6. Review and approve CQCP;
7. Prepare CQC summary report;
8. Stop work if required for compliance with CQC; and
9. Supervise Versar's site QC officer.

This letter serves as the designation of sufficient authority for Mr. David A. Basko to perform the functions of the CQCM and is executed by authorized official of Versar, Inc.

Very truly yours,

G J Anastos

G.J. Anastos, Ph.D., P.E.
Vice President

APPENDIX B

SAMPLING AND TESTING REQUIREMENT SUMMARY

Versar INC.

APPENDIX B - SAMPLING AND TESTING REQUIREMENT SUMMARY

Item	Test	Sample Frequency/Location
General Grading Fill (Suitable Material)	Standard proctor, ASTM D698 Nuclear densitometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content, ASTM D2216 Sand cone, ASTM D1556	1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests
Soil Cover (Select Material)	Standard proctor, ASTM D698 Sieve analysis, ASTM D422 Moisture content, ASTM D2216 Atterberg limits, ASTM D4318 Nuclear densitometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content, ASTM D2216 Sand cone, ASTM D1556 Lift depth check Hydraulic conductivity ASTM D2434	1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests Placed material, 1 per ¼ acre (or 100 foot centers) per 6 inch lift 1 per 5,000 cubic yards or each change in source
Fine Aggregate Subbase	Sieve analysis, ASTM D422 Lift depth check	1 per 5,000 cubic yards or each change in source 5/acre/lift Placed material 1 per ¼ acre (or 100 foot centers)

APPENDIX B - SAMPLING AND TESTING REQUIREMENT SUMMARY

Item	Test	Sample Frequency/Location
Select Material Backfill (Southern Concrete Pad)	Standard proctor, ASTM D698 Sieve analysis, ASTM D422 Moisture content, ASTM D2216 Atterberg limits, ASTM D4318 Nuclear densitometer, ASTM D2922 Moisture content, ASTM D3017 Moisture content ASTM D2216 Sand cone, ASTM D1556 Lift depth check	1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 1 per 5,000 cubic yards or each change in soil type 5/acre/lift 5/acre/lift Minimum of 1 per 10 ASTM D3017 tests Minimum of 1 per 20 ASTM D2922 tests Placed material, 1 per ¼ acre (or 100 foot centers) per 6 inch lift
Vegetative Layer	Soil classification ASTM D2487 Lift depth check	1 per 5,000 cubic yards or each change in material type Placed material, 1 per ¼ acre (or 100 foot centers)
60 mil, HDPE liner	**Conformance**	
	Density, ASTM D792A or ASTM D1505	1 per 100,000 ft^2
	Carbon black contents, ASTM D1603	1 per 100,000 ft^2
	Carbon black dispersion, ASTM D2669	1 per 100,000 ft^2
	Thickness, ASTM D751	1 per 100,000 ft^2
	Tensile Characteristics, ASTM D638	1 per 100,000 ft^2
	Melt Flow, index ASTM D1238	1 per 100,000 ft^2

APPENDIX B - SAMPLING AND TESTING REQUIREMENT SUMMARY

Item	Test	Sample Frequency/Location
60, mil, HDPE liner (continued)	**Installation-Seams**	
	Destructive, peel and shear, ASTM D4437 Sheet ASTM D638	Random locations, 1 per 4 hours of seaming, or minimum of 1 per day per seamer
	Nondestructive testing, vacuum ASTM S4437-84 or air pressure for fusion	All seams
Geotextile	**Conformance**	
	Mass per unit area, ASTM D3776	1 per 100,000 ft^2
	Burst strength, ASTM D3786	1 per 100,000 ft^2
	Permittivity ASTM D4491	1 per 100,000 ft^2
	Apparent opening size, ASTM D4751	1 per 100,000 ft^2
	Grab strength, ASTM D4632	1 per 100,000 ft^2
	Trapezoidal tear, ASTM D4533	1 per 100,000 ft^2
	Puncture strength, ASTM D4833	1 per 100,000 ft^2
	Thickness, ASTM D1777	1 per 100,000 ft^2
	Construction	
	Overlap 12 inch minimum	All seams
	Sewn - 4 inch minimum	All seams

APPENDIX B - SAMPLING AND TESTING REQUIREMENT SUMMARY

Item	Test	Sample Frequency/Location
Geocomposite	Mass per unit area, ASTM D3776	1 per 100,000 ft^2
Erosion Control Revetments	Mass per unit area, ASTM D3776 Trapezoidal Tear, ASTM D4533 Density, ASTM D792 Fiber Tensile Strength, ASTM D2101 Chemical Resistance, ASTM D543 Strip Tensile Test, ASTM D1682 Thickness, ASTM D1777 Falling Head Permittivity, ASTM D4491 Seam Strength, ASTM D751 Wuzenbeek Abrasion Resistance, ASTM D4157 Grab Strength, ASTM D4632 UV Light Resistance, ASTM D4355 Mullen Burst Test, ASTM D3786 Puncture Test, ASTM D3787	1 per project

APPENDIX C

CONSTRUCTION QUALITY CONTROL REPORTING FORMS

Versar INC.

TRANSMITTAL FORM

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

To: ______________________ Project: ______________________

______________________ ______________________

Date: ______________________ Job No: ______________________

We are enclosing ______ copies of the following:

- ☐ Subcontractor Agreement
- ☐ Shop Drawings
- ☐ List of Materials
- ☐ Plans
- ☐ Specifications
- ☐ Submittals List
- ☐ Daily Report
- ☐ Progress Report
- ☐ ______________________
- ☐ Photograph Data Sheet
- ☐ Report of Field Change
- ☐ Daily QC Report
- ☐ Non-Compliance Notice
- ☐ Final Certification
- ☐ For Your Use
- ☐ For Review and Comment
- ☐ For Approval

Remarks:

____

____

____

____

____

Copies To: ______________________ By: ______________________

______________________ ______________________

______________________ ______________________

Versar INC.

PHOTOGRAPHIC REPORTING DATA SHEET

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Date: ____________________

Time Period Photographs Were Taken: ____

Roll Number: __________________ Frame Number: ________________________

General Description of Photographs:

____

____

____

____

____

____

____

____

Any Specific Items for the Record:

____

____

____

____

____

____

____

____

By: ______________________________ Title: ______________________________

Distribution: 1. Project Manager
2. Engineer

Versar INC.

CONSTRUCTION SUPERINTENDENT'S DAILY REPORT

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Date: ______________________

Day	S	M	T	W	TH	F	S

WEATHER	Brite Sun	Clear	Overcast	Rain	Snow
TEMP.	< 32°F	32-50°F	50-70°F	70-85°F	> 85°F
WIND	Still	Moderate	High	Report No.	
HUMIDITY	Dry	Moderate	Humid		

Average Field Force			
Name of Contractor	Non-Manual	Manual	Remarks
Visitors			
Time	Name	Representing	Remarks

Equipment at the Site:

____

____

____

____

____

Construction Activities:

____

____

____

____

____

By: ______________________ Title: ______________________

Distribution:
1. Construction Manager
2. Quality Control Manager
3. Project Manager
4. Engineer

Versar INC.

CONSTRUCTION SUPERINTENDENT'S MONTHLY REPORT

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Work Accomplished by Contractor:

Work Anticipated for Next Month:

Problems:

By: ______________________ Title: ______________________

Distribution: 1. Construction Manager
2. Project Manager
3. Engineer

CONSTRUCTION SUPERINTENDENT'S MONTHLY REPORT
(Continuation Sheet)

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Work Accomplished by Contractor (Continuation Sheet)

Versar INC.

DAILY QUALITY CONTROL REPORT
ENVIRO-CHEM, ZIONSVILLE, INDIANA

Daily Report No. ______________________________ Date: _________________________

1. Contractor/Subcontractor and Area of Responsibility:

Number	Trade	Hours	Employer: Location/Description of work

2. Operating Equipment:

Equipment	Date of Arrival/ Departure	Date of Safety Check	Hours Used	Hours Idle	Hours for Repair

3. Work Performed Today (Indicate location and description of work performed by prime and/or subcontractors.):

____

____

____

____

____

____

____

____

4. Control Activities Performed (Identify inspections performed, results of inspections compared to specification requirements, and corrective actions taken when deficiencies are noted.):

5. Tests Performed and Test Results (Identify test requirements by paragraph number in specifications and/or sheet number in plans.):

6. Material Received (Note inspection results and storage provided.):

Versar INC.

7. Submittals Reviewed:

Submittal No.	**Spec./Plan Reference**	**By Whom**	**Action**

8. Off-Site Surveillance Activities, Including Actions Taken:

9. Job Safety (List items checked, results, instructions, and corrective actions.):

10. Remarks (Include instructions received or given, conflicts in plans and/or specifications, and delays encountered.):

Versar's Verification: On behalf of Versar, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

Site Quality Control Officer

Versar INC.

REPORT OF FIELD CHANGE

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Date: ____________________

REFERENCE DATA

Specification Sheet No. __________ Page No. __________ Paragraph No. __________

Drawing No. __________ Entitled: ______________________________

Sketch No. __________ Dated: __________ Entitled: ______________________________

DESCRIPTION

1. Detailed Identification of the Problem:

____
____
____
____
____
____

2. Detailed Solution Proposed or Accomplished:

____
____
____
____
____
____

3. Is the Problem an Isolated Case or General? ______________________________

4. Submit Sketches as Necessary

By: ______________________________ Title: ______________________________

Distribution:
1. Construction Manager
2. Quality Control Manager
3. Project Manager
4. Engineer

Versar INC.

NON-COMPLIANCE NOTICE

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

To: ____

Date: __________ Time (AM/PM): __________ Inspector: ____________________

Contractor. ____________________________ Contract No. ____________________

You are hereby notified that ☐ tests ☐ inspections indicates that the____________________

____

does not conform to the Specifications requirements. The specification violated is

Section __________ Article/Paragraph ______________. Under the provisions of the Contract

Specifications, the requirements are______________________________________

____

____.

Noncomplying work may be required to be removed and replaced at no cost to the ECC Trust.

It shall be your responsibility to determine the corrective action necessary, and to determine whether you wish to discontinue operations until additional investigations by the ECC Trust or Engineer confirm or refute the initial findings.

____

Site Quality Control Officer

Noncompliance notice was received by the Constuction Manager on ____________________(date).

By: ____________________________ Title: ____________________________

Distribution:
1. Construction Manager
2. Quality Control Manager
3. Project Manager
4. Engineer

Versar INC.

FINAL CERTIFICATION OF COMPLETION

ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

To: ECC Trust Date: ______________________

Attn: ETC Engineer

From: ____

This is to certify that I, ____ am an authorized official of ____ working in the capacity of ____ and have been properly authorized by said firm or corporation to sign the following statements pertaining to the subject contract:

> I know of my personal knowledge, and do hereby certify, that the work of the Contract described above has been performed, and materials used and installed in every particular, in accordance with, and in conformity to, the Contract Drawings and Specifications.
>
> The Contract work is now complete in all parts and requirements, and ready for your final inspection.

By: ____

Title: ____

For: ____

Distribution:
1. Engineer
2. ECC Trust
3. U.S. EPA
4. IDEM

CONCRETE PLACEMENT REPORT

Project ______________________ Report No. ______________

Drawing No. ______________________ Placement Date. ______________

Contractor ____

Concrete furnished by ______________________________________

Location of Placement:

Check off:

Mechanical ______________
Piping ______________
Electrical ______________
Misc. Iron ______________
Reinf. Steel ______________
Anchor Bolts ______________

Remarks Placement Method:

Weather Conditions: ______________

Actual quantity: ______________ CY Total Quantity to date ______________ CY

Type of Admixtures: ______________

Type Mix: ______________ Specified Finish: ______________

Time Started: ______________ Time Completed: ______________

Slump Test Result ______________

Test Cylinders: No. ______________ through ______________

Date cylinders delivered to testing laboratory: ______________

See attached reports for test results.

Construction Engineer ______________________ Date ______________

Contractor Representative ______________________ Date ______________

PIPING PRESSURE TEST REPORT

Subcontractor ____

Date of Test ______________________ Drawing No. ______________

System & Class ______________________ Line I.D, & Location ______________

Material ______________ Design Pressure ____________ Serv. Temp. ________

Limits of Test ____

(valve to valve No.; weld to weld No.; etc.)

Type of Test:

- ☐ Hydrostatic
- ☐ Pneumatic ______ with soap film
  ______ without soap film
- ☐ Vacuum Box
- ☐ Halogen
- ☐ Helium Mass spectrometer
- ☐ Other (specify) ______________

Time Test Started ______________ Gauge Pressure at Start ______________

Time Test Completed ______________ Gauge Pressure at Completion ______________

Holding Time ______________ Test Pressure ______________

Results of Test ☐ Passed ☐ Rejected

Remarks: (If rejected, no. & location of leaks) ______________________________

____

____

____

____

____

____

Test Performed by ______________________ Employer ______________

Test Witnessed by ______________________ Date ______________

EQUIPMENT START–UP–ALIGNMENT & ROTATION CHECK

Equip. Item ______________________ Tag No. ______________ P.O. No. ______________

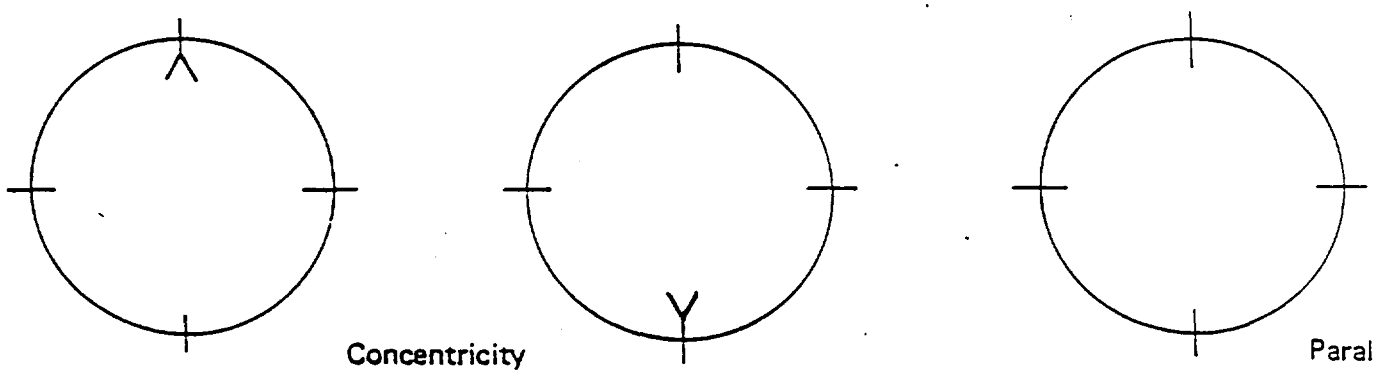
Contractor ____ Contract No. ______________

Project ______________________ No. ______________ P.O. No. ______________

Client ____ Reference ______________

____

The above equipment has been checked by the Contractor for alignment and the final readings are shown below.



Concentricity

Parallel

Readings are recorded viewing from driver and indicator fixed to ______________________ (shaft)

Coupling spacing – ______________________

The above equipment has been lubricated, checked and is ready for motor drive rotation check. Insulation Resistance Check performed on ______________ (date)

Motor drive rotation looking from back of motor is CW/CCW.

Witnessed By:

Representative ____ Date ______________

'gnment ____ Date ______________

Contractor Representative

Rotation ____ Date ______________

Contractor Representative

Engineer Acknowledgement ______________________________ Date ______________

INSULATION RESISTANCE CHECK

Contractor ______ No. ______

Contract for ______ Vendor No. ______

Project: Project No. ______

Reference ______

Company ______

______

EQUIPMENT NAMEPLATE DATA

Customer ______ Location ______ Date ______

Equipment Type ______ Manufacturer ______

Serial No. ______

MOTOR NAMEPLATE DATA

Circuit ______ Manufacturer ______

Style ______ Voltage ______ Amps ______

Serial No. ______ R.P.M. ______ Service Factor ______

Frame ______ H.P. ______ Model ______

Type ______ Locked Rotor Code ______ Ins. Class ______

Duty ______ Frequency ______

INSULATION RESISTANCE CHECK

Date ______	______	______	______	______
Ø1–GR ___ OHM	Ø1–GR ___ OHM	Ø1–GR ___ OHM	Ø1–GR ___ OHM	Ø1–GR ___ OHM
Ø2–GR ___ OHM	Ø2–GR ___ OHM	Ø2–GR ___ OHM	Ø2–GR ___ OHM	Ø2–GR ___ OHM
–GR ___ OHM	Ø3–GR ___ OHM	Ø3–GR ___ OHM	Ø3–GR ___ OHM	Ø3–GR ___ OHM
Ø1–Ø2 ___ OHM	Ø1–Ø2 ___ OHM	Ø1–Ø2 ___ OHM	Ø1–Ø2 ___ OHM	Ø1–Ø2 ___ OHM
Ø2–Ø3 ___ OHM	Ø2–Ø3 ___ OHM	Ø2–Ø3 ___ OHM	Ø2–Ø3 ___ OHM	Ø2–Ø3 ___ OHM
Ø3–Ø1 ___ OHM	Ø3–Ø1 ___ OHM	Ø3–Ø1 ___ OHM	Ø3–Ø1 ___ OHM	Ø3–Ø1 ___ OHM

Functional Test

TEST SEQUENCE NO. ______________

DATE ______________

AREA ______________ EQUIPMENT NAME ______________

DRAWING NO. ______________ REV. ______________

CONTROL CIRCUIT CHECK

INPUT VOLTAGE ______________

CURRENT PHASE A ______________ B ______________ C ______________

SAFETY DEVICES ______________ FILTERS INSTALLED ______________

ROTATION CHECKED ______________ LUBRICATION CHECK ______________

CHECKED ______________

AMBIENT TEMP. ______________ TIME START ______________ TIME COMPLETE ______________

FEEDER CABLE MEGGARED

A/B ______________ B/C ______________ A/C ______________

A/Grd. ______________ B/Grd. ______________ C/Grd. ______________

PUNCH ITEMS LIST COMPLETE ______________

VENDOR COMMISSIONING PROCEDURES ADHERED TO ______________

SUPPORT SERVICE EQUIPMENT OPERATING ______________

TEST ENGINEER ______________

Lubricant & Hydraulic Fluid Data Sheet

EQUIPMENT ______________________

SUPPLIER ______________________

GEN. ASSEMBLY DWG. NO. ______________________

EQUIP. NO.	POINT OF USE	SPECIFICATIONS	LUBRICANT	CONSUMPTION PER DAY	SUMP CAPACITY	RECOMMENDED LUBRICANT CHANGE PERIOD

CONSTRUCTION REPORT OF ACCIDENT

Contractor ______________________ Report No. ______________

Contract for ______________________ Specification No. ______________

Project ______________________ Project No. ______________

Client ______________________ Reference: ______________

Insurance Report Attached ______________________

Time of Accident ______________ 19____ at ______ AM ________ PM ________

Description of accident:

If resulting in injury:

Name of contractors employee ______________________

Address ______________________

Nature of injury (if known) ______________________

Action taken to care for injured ______________________

Other remarks ______________________

Report prepared by ______________________

Date ______________________

REPORT OF CONSTRUCTION

WORK STOPPAGE

Work Stopped ☐
Work Dispute ☐

Work Involved:

Client:

PROJECT REPORT NO. ________

Date of stoppage or dispute ______________ No. of workmen involved ________

Date work resumed or dispute settled ______________ Hours lost ______________

Contractor:

Crafts involved:

Issue:

How Resolved:

Remarks:

Prepared by ______________

Date ______________

EQUIPMENT STATUS REPORT

Project ______________________ Date ______________ Page __________

Vendor Prints In ________ Manuals ________

Purchase Order No.	Vendor	Change Order	Equipment	Ship By:	Date Received	Transfer To & Date	

MATERIAL RETURNED TO VENDOR REPORT

Job No. ____________________ M.R. No. ____________________

Date ____________________

The following materials, received on our P.O. No. ____________________

Issued to ____________________ are being returned to ____________________

by authority of Mr. ____________________ (Title) ____________________

Authorization Phoned ________ Confirmed ________ Written ________ Date ________

Item Quantity	Description	Remarks

Reason for return ____________________

____

Shipping Instructions:

Prepaid ________

Collect ________

Date Shipped ________

____

Name & Title

Date Prepared ____________________

M.R. No. ____________________

Testing requirements for mechanical systems will be developed from the manufacturer's installation requirements and procedures after the equipment has been ordered.

3

VERSAR'S HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

PREPARED FOR:
ENVIRONMENTAL CONSERVATION AND
CHEMICAL CORPORATION SITE TRUST FUND

VERSAR PROJECT NUMBER 3709

FEBRUARY 1998
REVISION 2

DOCUMENT RELEASE AUTHORIZATION

This Health and Safety Plan has been prepared for the Environmental Conservation and Chemical Trust to control all health and safety activities related to construction performed for the implementation of the Revised Remedial Action at the Enviro-Chem Superfund site in Zionsville, Indiana. This plan has been prepared in accordance with the requirements specified in Versar's Contract with the Trustees and the contract specifications prepared by Radian International, including Revised Exhibit A.

Mark R. Brown, C.I.H.
Health and Safety Officer

David A. Basko
Quality Control Manager

George J. Anastos, Ph.D., P.E.
Remedial Project Manager

DOCUMENT RELEASE AUTHORIZATION

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Mark R. Brown, C.I.H.
Health and Safety Officer

David A. Basko
Quality Control Manager

George J. Anastos, Ph.D., P.E.
Remedial Project Manager

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APPENDICES

LIST OF ACRONYMS

Personnel

CM	Construction Manager
CS	Construction Superintendent
HSO	Health and Safety Officer
MC	Medical Consultant
PM	Remedial Project Manager
QCM	Quality Control Manager
SHSO	Site Health and Safety Officer
SQCO	Site Quality Control Officer
TL	Team Leader

Equipment

LEL/O_2	Lower Explosive Limit/Oxygen
PID	Photoionization Detector

Areas

CRZ	Contamination Reduction Zone
EZ	Exclusion Zone
SZ	Support Zone

Manuals

AMP	Air Monitoring Plan
HSP	Health and Safety Plan
SDCP	Spill Discharge and Control Plan

Others

ABIH	American Board of Industrial Hygiene
ACGIH	American Conference of Governmental Industrial Hygienists
ARC	American Red Cross
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
IDEM	Indiana Department of Environmental Management
MSDS	Material Safety Data Sheets
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPM	Parts Per Million
USCG	United States Coast Guard
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

1.1 Background

This Health and Safety Plan (HSP) has been developed for the remedial action activities to be conducted at the Environmental Conservation and Chemical Corporation (ECC or Enviro-Chem) Site, located in Zionsville, Indiana. The HSP contains the procedures that are necessary to protect onsite personnel and the general public during this phase of work. All Versar/Handex personnel, as well as subcontractors and visitors to the site, will be required to abide by all of the requirements of this HSP. Included in these requirements is a policy that all activities will be performed in a drug-free work place and that employees will be subject to drug testing. All Versar/Handex, Radian, and subcontractor personnel will acknowledge and agree to this policy by signing the Substance Abuse Policy Statement (see Figure 3-1). EPA and IDEM employees will also be required to sign a form acknowledging this policy's existence, however, they will not be required to agree to the drug testing requirements (see Figure 3-2).

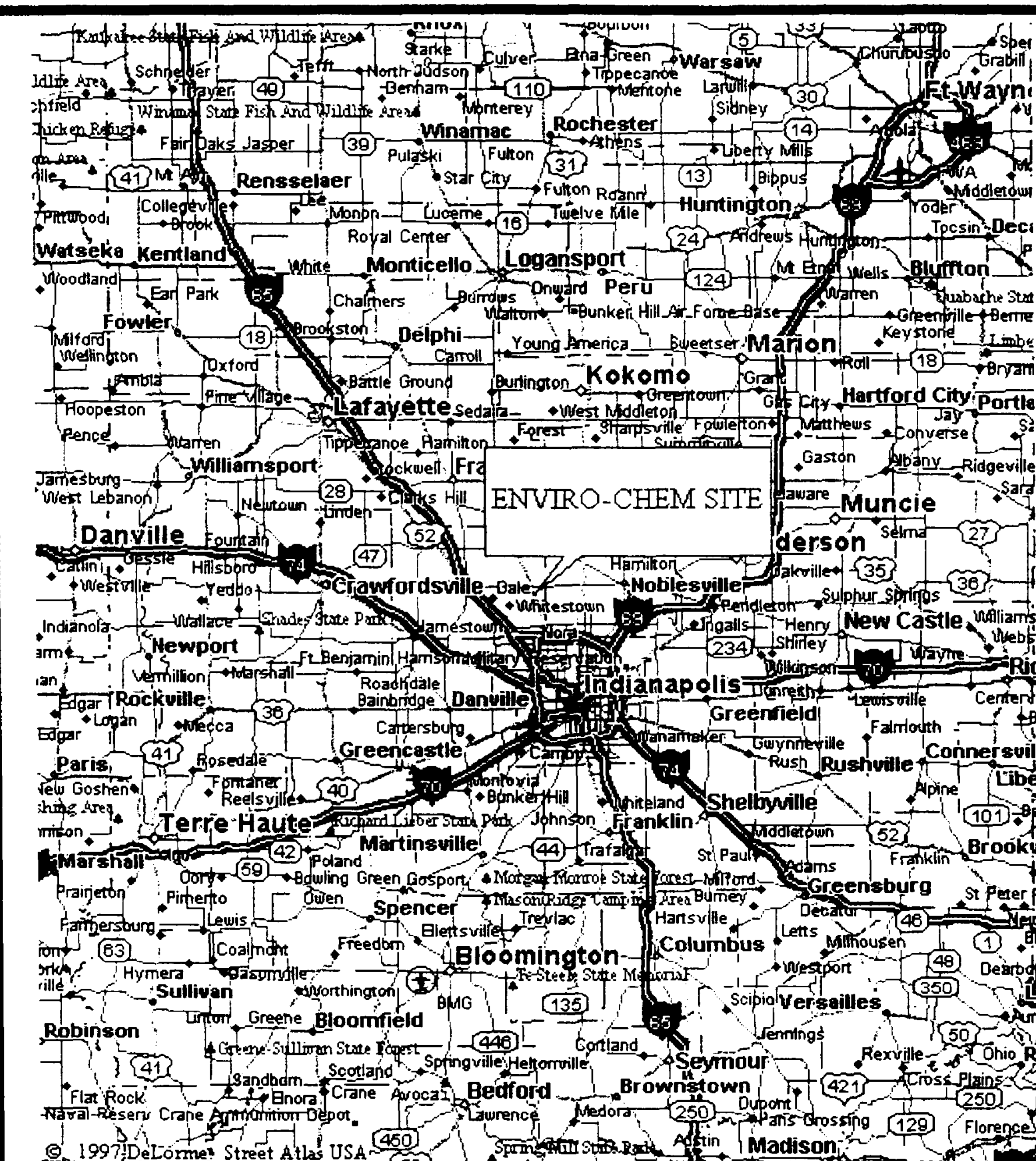
The ECC Site is located in Boone County, approximately 10 miles northwest of Indianapolis, on State Route 421 in Zionsville, Indiana (see Figure 1-1). The site occupies 6.5 acres to the west of the Northside Sanitary Landfill (NSL), a closed solid waste disposal facility. The ECC Site is also bounded on the south and east by NSL property. An unnamed ditch separates the two facilities along the eastern boundary. Several residential homes are located within ½ mile of the facility to the north and west. A detailed location map is presented in Figure 1-2.

In 1977, ECC began operations at the site that consisted of the recovery, reclamation, and brokering of primary solvents, oils, and other wastes. Waste products were received in drums and bulk tankers and prepared for subsequent reclamation or disposal. Processes to reclaim solvents and oil included distillation, evaporation, and fractionation.

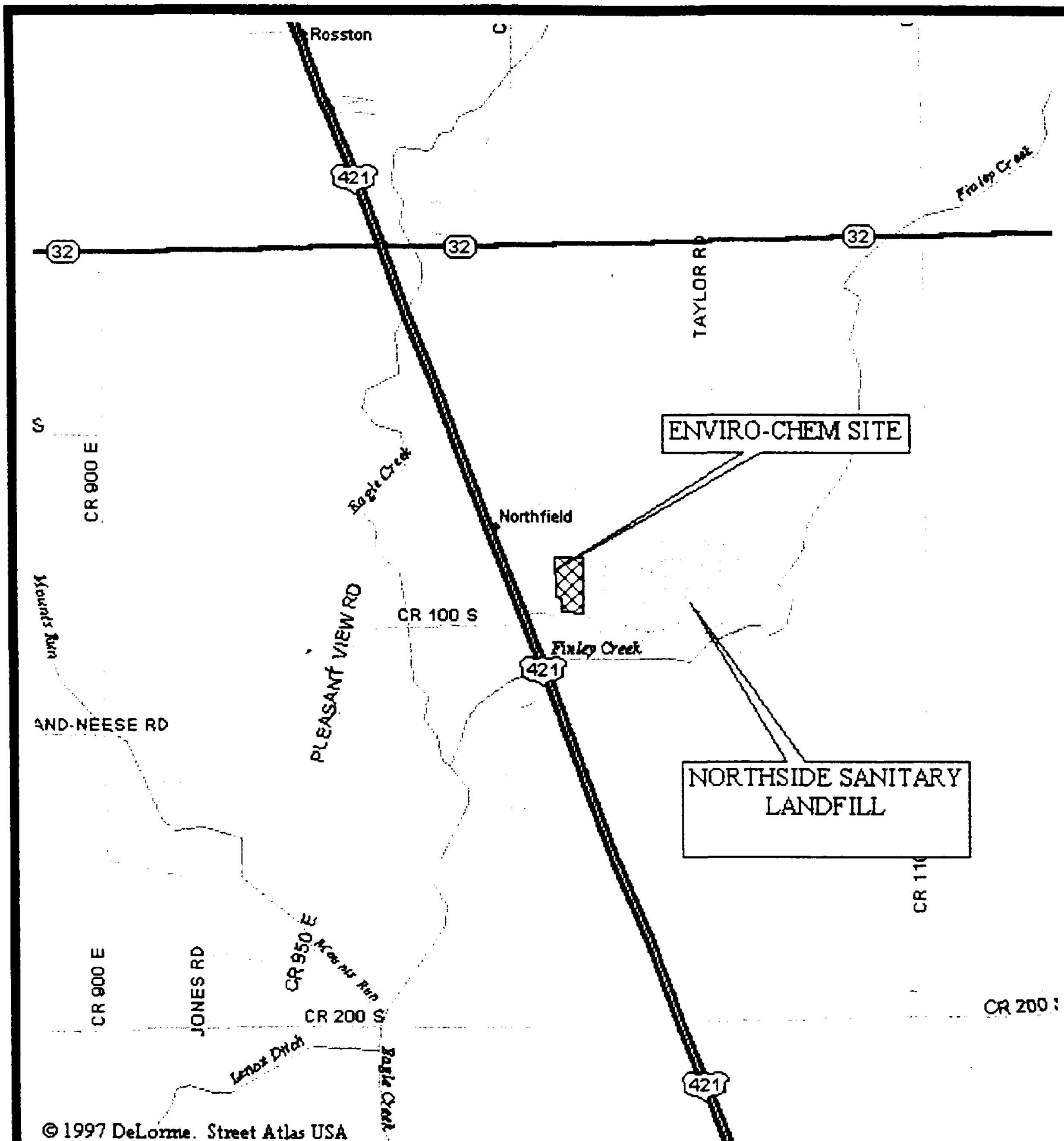
The U.S. Environmental Protection Agency (U.S. EPA) investigations concerning the accumulation of contaminated storm water on-site, improper drum inventory, and several spill incidents lead to civil law suits, and finally the placement of ECC into receivership in July 1981.

Drum shipments to the site were halted in February 1982. Surface clean-up activities conducted by U.S. EPA contractors during 1983 and 1984 included the removal of cooling pond waters, waste drums, tank wastes, contaminated soil, and cooling pond sludge.

A Remedial Investigation/Feasibility Study (RI/FS) was conducted by CH2M Hill for the U.S. EPA from 1983 through 1986. The Record of Decision (ROD) for the site was issued on September 25, 1987, and amended on June 7, 1991. The Consent Decree for remediation of the site was entered on September 10, 1991.



HEALTH AND SAFETY PLAN REVISED REMEDIAL ACTION ENVIRO-CHEM SUPERFUND SITE ZIONSVILLE, INDIANA	FIGURE 1-1 SITE LOCATION MAP
	NOVEMBER 1997
Source: DeLorme Street Atlas USA	Versar INC.



HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Source: DeLorme Street Atlas USA

FIGURE 1-2
DETAILED LOCATION MAP

NOVEMBER 1997

Versar INC.

The original remedial action included in the original Exhibit A of the Consent Decree consisted of *in-situ* soil vapor extraction (SVE), a Resource Conservation and Recovery Act (RCRA) compliant Subtitle C cover (RCRA-compliant cover), access restrictions, and subsurface and surface water monitoring. The Consent Decree was signed by the U.S. EPA, the State of Indiana, and a group of Potentially Responsible Parties (PRPs), and was entered in the U.S. District Court for the Southern District of Indiana on September 10, 1991.

Exhibit A and the Consent Decree were revised to reflect additional data obtained from supplemental site investigations and several engineering and operational modifications to the remedial action.

Revisions to the original remedial action described in the original Exhibit A have been made, with U.S. EPA's approval in part because saturated conditions beneath the southern concrete pad would interfere with the implementation of *in-situ* SVE in that area. The site conditions were better defined as a result of a number of reports, including the November 1994 Southern Concrete Pad Area Investigation Report. The 1994 investigation report provided new data that indicates the presence of sand deposits in the lower portion of the proposed zone of SVE treatment, in the eastern area of the concrete pad. This sand deposit may be hydraulically connected to the sand water bearing zone beneath the till. The investigation also confirmed that the potentiometric surface of the sand water bearing zone is 4 to 6 feet below ground surface in the southern area of the site.

The remedy presented in the original Exhibit A has been modified to address the concrete slab and soils from the southern concrete pad area by including the excavation and spreading of these materials onto the northern portion of the site for treatment by SVE, rather than *in-situ* SVE of the area. The excavation created will be backfilled with native soils. Additionally, modifications have been made to the final cover design. The revised Exhibit A and Consent Decree were approved by U.S. EPA in August, 1996.

1.2 Scope of Activities

A detailed scope-of-work for this project is outlined in the project specifications and final design documents. A summary of the activities is presented below.

Soil vapor extraction (SVE) will be employed over the northern and central areas of the site. The southern area of the site, which includes a concrete pad, aggregate subbase, and subsurface soils, will be excavated to approximately 9 feet and placed on the northern portion of the site for SVE treatment. The concrete pad will be crushed into pieces with a maximum dimension of 3 inches prior to placement on the northern portion of the site and will be crushed to less than 1 inch to be utilized as backfill in the SVE trenches. A low permeability barrier will then be installed between the central and southern areas of the site to minimize migration of subsurface water and/or vapor from the central area to the southern areas. The excavation at the southern area of the site will then be backfilled with native soils. The northern and central site areas will be capped with a RCRA Subtitle C cover. The southern concrete pad area soils will be remediated by performing the following activities:

- Pressure grout the existing 20-foot by 20-foot by 12 feet deep sump (i.e., the ECC sump) located in the concrete pad area. The ground interval will be from the floor of the excavation to the bottom of the sump;

- Crush the concrete pad into pieces with a maximum diameter of 3 inches, and place the crushed concrete along with the aggregate subbase in a segregated treatment zone in the northern end of the site and into the SVE trenches. The concrete pad and subbase aggregate at the former process building will also be removed, crushed, and combined with the crushed southern concrete pad for SVE treatment;

- Water collected in the sump and the excavation will be pumped to temporary storage facilities and will either be disposed of offsite or treated onsite and discharged to surface water in accordance with applicable Federal, state and local regulations;

- Excavate the subsoils beneath the southern concrete pad area;

- Perform exit soil sampling in the excavation (by U.S. EPA);

- Install low permeability barrier and drainage layer between the excavation and SVE treatment area;

- Backfill the excavated area with native soils;

- Place a 12-inch layer of topsoil on the backfill soils in the excavated area and seed with appropriate vegetation. Capping of the excavation area will be based on the results of exit soil sampling in the excavation;

- SVE construction; and

- SVE operation and maintenance.

2.0 VERSAR'S ORGANIZATION AND RESPONSIBILITIES

2.1 General

Versar believes that health and safety, like all other essential project components, is a line management responsibility. Versar's employees are trained to work safely and to eliminate health and safety hazards as they arise. Versar management is responsible for providing the technical resources, materials, planning, and direction to maintain the health and safety of all site personnel. The chain of responsibility begins with each site worker and extends, through the chain of command, to corporate management including the President and COO. Versar health and safety personnel are responsible for providing technical support and oversight regarding health and safety.

In addition to this site-specific HSP, Versar has developed a corporate Health and Safety Manual to meet the requirements of 29 CFR 1910.120(b)(1)(I). This Health and Safety Manual incorporates an organizational structure and includes requirements and standard operating procedures for Versar's medical surveillance program, hazard communication program, hearing conservation program, respiratory protection program, protective clothing program, protective equipment program, temperature stress, disease prevention, accident prevention, safety rules, site control and decontamination, egress and decontamination, confined space, excavations, and exposure control for bloodborne pathogens. Versar's Health and Safety Manual will be available at the Enviro-Chem site during all site activities, and its contents and requirements are incorporated into this HSP by reference. Where the requirements of this site-specific HSP are more detailed or prescriptive, or where they conflict with the requirements and procedures of the corporate Health and Safety Manual, the requirements specified herein will apply. However, in the absence of detailed requirements or procedures in this site-specific HSP, the general requirements of the corporate Health and Safety Manual will be followed. Some examples of general requirements from the corporate Health and Safety Manual that apply to site work during the Environ-Chem RRA include Versar's respiratory protection/protective equipment programs and confined space entry program, which are included as Appendices A and B, respectively.

Employees are responsible for reading, understanding and complying with the requirements of the Versar Health and Safety Plan. Additionally, employees are required to use their experience, training, and common sense to maintain health and safety for themselves and others. This includes reporting health and safety issues that they cannot abate, to their immediate supervisor.

Field Supervisors (in addition to the above) are responsible for maintaining health and safety for the employees that report to them. These individuals are to plan and execute field tasks (daily work assignments) in a manner and with tools and materials that will allow employees to work in a healthy, safe, and efficient manner. Field Supervisors' duties include the requirement that they solicit input and incorporate the positive ideas presented by the workers whose activities they oversee.

Versar's Remedial Project Manager (PM) is responsible for the overall direction, implementation, and enforcement of health and safety for the project. Daily implementation and enforcement of the HSP during field activities will be directed by the Construction Superintendent (CS). The CS will be technically assisted in this function by the Site Health and Safety Officer SHSO. The SHSO's main function is to serve as a technical advisor to line management in matters regarding health and safety. The SHSO will primarily be responsible for the technical and administrative functions relative to health and safety necessary during on-site activities. Additionally, although health and safety is a staff function, the SHSO has the authority to stop work if an "imminently dangerous" situation exists. Such a situation will be immediately reviewed by the PM and CS, and the Versar's Certified Industrial Hygienist (CIH). From a technical standpoint, the SHSO will report to the CIH, who will serve as the Health and Safety Officer (HSO) for this project.

All other personnel working on the Site will report to the CS and ultimately the PM and, in keeping with OSHA requirements and management principles, are required to comply with all procedures outlined in this HSP. Versar's organization chart for this project is presented in Figure 2-1.

2.2 Overall Management Responsibilities

The responsibilities and qualifications of the PM, CS, HSO, and the SHSO are described in the following subsections.

2.2.1 Remedial Project Manager

The PM is the overall manager of the project. The PM's health and safety responsibilities include the following:

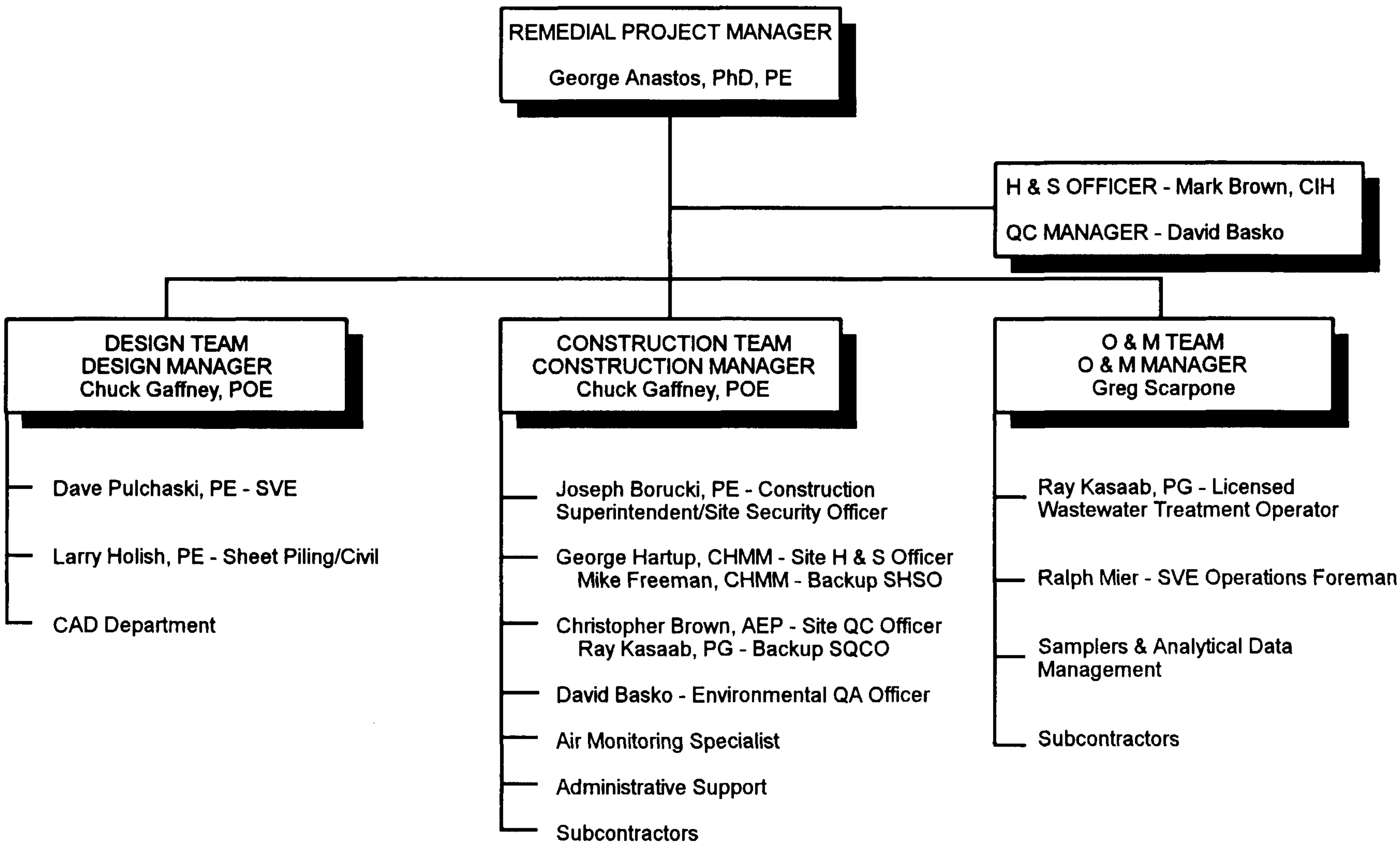
- To assure that the project is performed in a healthy and safe manner consistent with the requirements of the Versar's Corporate Health and Safety Program and all applicable OSHA regulations;

- To provide the required personnel, resources, materials, and equipment, to carry out the project in a health, safe, and efficient manner;

- To assure that site operations are continually evaluated, planned, and executed in a healthy and safe manner;

FIGURE 2-1

VERSAR/HANDEX ENVIRO-CHEM PROJECT TEAM ORGANIZATION CHART



- To assure that site management works to vehemently maintain the health and safety of the site and all employees; and

- To demand performance of subcontractors that complies with this HSP and all applicable OSHA regulations and safeguards to ensure the health and safety of their employees.

The PM has the authority to take the following actions:

- To determine personnel assignments on this project; and

- To temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the HSO.

George J. Anastos, Ph.D., P.E. is Versar's PM for the Revised Remedial Action at the Enviro-Chem site. Dr. Anastos has a Ph.D. in Civil (Sanitary) Engineering and a B.S. and M.S. in Chemical Engineering. He is a registered Professional Engineer in seven states, including Indiana, and is NCEE certified. He has 27 years of experience managing large multi-year, interdisciplinary contracts that include site assessment, NEPA compliance, design, and remediation activities for federal, state, municipal, and industrial clients. He has managed more than $250 million and has been responsible for more than $500 million in remedial construction projects that include: soil vapor extraction, pump and treat, dig and haul, immediate response actions, *in-situ* and *ex-situ* bioremediation, and high and low temperature thermal treatment. He has also managed more than $300 million in federal contracts for U.S. EPA and other federal agencies.

2.2.2 Construction Superintendent

The CS is the appointed manager of the project on the site. The CS is responsible for the general oversight of the progress of on-site activities, including the management of all on-site field personnel, and for implementing actions to ensure compliance with the HSP.

The CS is responsible for:

- Coordinating and providing the necessary labor and materials for the safe, healthy, and efficient progress of site activities;

- Assuring that all on-site activities are carried out in a manner that is in compliance with both this HSP and all applicable OSHA regulations;

- Actively supporting job site safety by including these issues as a key components of pre-job planning and scheduling;

- Evaluating job specifications for potential safety and health hazards and reviewing with the safety representatives;
- Actively communicating job site safety and health control measures among contractors and employees; and
- Actively supporting and participating in the implementation of the Safety Program pertaining to company employees.

The CS for the Revised Remedial Action at the Enviro-Chem site is Mr. Joseph D. Borucki, P.E. Mr. Borucki has a B.S. in Engineering and over 30 years of design/construction experience for industrial/commercial, federal, and municipal clients. He has served as a Project Manager responsible for all financial budgeting and cost controls, subcontract administration, construction scheduling, contractor meetings, and quality control, and he has worked on a variety of construction and expansion projects. These construction and expansion projects have ranged from $1 to $50 million in size and 12 to 30 months in duration, and have included hazardous waste remedial construction projects, including decommissioning and decontamination of tanks and buildings with removal, transportation, and disposal activities; general construction projects, including installation of underground drainage systems, soil excavation, installation of soil caps, transportation and disposal of hazardous waste off-site; turnkey remedial design/remedial construction projects, including permitting, scheduling, budget control, subcontractor procurement and coordination, and start-up operations; and turnkey design/build projects for a wastewater treatment plant, a water treatment plant, and miscellaneous manufacturing facilities.

2.2.3 Health and Safety Officer

Versar will utilize the services of an industrial hygienist certified by the American Board of Industrial Hygiene (ABIH) in Comprehensive Practice to serve as the HSO. The HSO is responsible for the approval of this HSP. The HSO is also responsible for assisting the PM in implementing and enforcing the HSP, and he will be part of the Quality Control (QC) staff. Specific responsibilities include:

- Providing on-site health and safety support on an "as needed" basis;
- Providing expert health and safety guidance and support to the SHSO, CS, and PM for all on-site health and safety activities, as needed, and for decision-making involving the upgrade or downgrade in personal protective equipment;
- Providing health and safety regulatory interpretation and compliance assistance;
- Management and administration of related health and safety documentation, including, but not limited to, employee medical qualifications, respirator fit tests, medical surveillance, and field monitoring results;

- Development and maintenance of Versar's corporate Health and Safety Program;
- Authority to stop work if conditions are deemed unsafe; and
- Authority to temporarily remove an individual from the Site if he/she is not complying with the HSP protocols.

Mark R. Brown, C.I.H., is the HSO for the Revised Remedial Action at the Enviro-Chem site. Mr. Brown has a B.S. in Industrial Hygiene and has over 13 years of experience as a health and safety professional. He has provided health and safety leadership training, technical support, and hands-on manpower in a wide variety of industries and settings, including hazardous chemical handling, in-plant and transportation chemical emergency response, heavy hazardous waste site remediation, chemical process plant cleanup and demolition, laboratory (analytical and experimental), waste-related drilling operations, underground storage tank management, pilot plants, mixed wastes, lead paint abatement, and asbestos abatement, as well as high tech and heavy industries. Mr. Brown's career has provided him with significant environmental (greater than 1,000 days on site during remediation) and manufacturing (greater than 1,500 days on the shop floor) health and safety experience.

2.2.4 Site Health and Safety Officer

The SHSO is the on-site health and safety representative. The SHSO will be assigned to the project on a full-time basis and will assist the CS in the implementation of this HSP by providing on-site health and safety support and oversight. The SHSO will work directly with the CS, but will report to the HSO in matters pertaining to site safety and health. The SHSO will be responsible for the day-to-day administration of the overall program and implementation of the HSP.

Specific duties of the SHSO include, but are not limited to:

- Conducting the initial site-specific health and safety orientation meeting and providing support for additional meetings as periodically required;
- Monitoring compliance with the HSP;
- Coordinating and conducting on-site safety briefings for all site personnel;
- Managing health and safety equipment (e.g., respirators, instruments, boots, gloves, suits, etc.);
- Coordinating and performing air monitoring as specified in the HSP;

- Establishing work/rest regimen in conjunction with the CS (i.e., heat stress/cold stress monitoring);

- Helping establish emergency response provisions with local authorities (e.g., hospital, fire, and police);

- Continuously monitoring health and safety conditions during the implementation of the site work;

- Maintaining site safety field logs to record air monitoring results, weather conditions, employees on-site, safety problems, and other related information;

- Reporting all incidents to the HSO;

- Stopping work if conditions are deemed unsafe; also to temporarily remove an individual from the site if he/she is not complying with the HSP. In both cases, the SHSO will confer with the HSO and CS regarding the follow-up actions. The presence of an SHSO will not abrogate safety responsibilities of other personnel;

- Administration of all occupational recordkeeping;

- Daily safety inspections of work areas; and

- Preparation of daily health and safety reports.

The Site Health and Safety Officer (SHSO) for the Revised Remedial Action at the Enviro-Chem site is George R. Hartup, CHMM. Mr. Hartup has a B.S. in Environmental Health & Safety and over 20 years of experience in the field of environmental health and safety. He has been responsible for the implementation and management of all on-site safety procedures, as well as being the on-site trenching/shoring competent person for all excavations of contaminated soil, at the Harris Street Superfund site. He was also responsible for controlling all on-site personnel monitoring with site entry personnel monitoring equipment, as well as sampling and analysis of soil, sediments, surface water, and groundwater. He has also prepared health and safety plans and managed site safety during the construction of a wastewater treatment plant and has been responsible for hazardous material release response actions on a variety of projects.

Mr. Hartup is an OSHA hazardous waste operations supervisor, a Certified Hazardous Materials Manager (CHMM), and a certified instructor for OSHA. He is also certified in both CPR and first aid rescue and is a certified by the State of California as an instructor for both Hazardous Material Management and Incident Command.

2.2.5 Examining Physician

In accordance with OSHA requirements, Versar uses the services of several local, licensed occupational physicians (i.e., different local physicians are used at different office locations). These physicians follow a standard protocol and provide their examination results to a medical monitoring oversight company, EMR of Atlanta, Georgia, who administers, reviews, and manages this program for Versar. The EMR program includes assuring compliance with all applicable OSHA standards, including those specified in 29 CFR 1910.120, 29 CFR 1910.134, and 29 CFR 1926.1101. Dr. Elayne F. Theriault of EMR is Versar's medical monitoring program coordinator.

3.0 MEDICAL MONITORING

3.1 Medical Surveillance Requirements

Prior to entering the project exclusion zone or contamination reduction zone, all site personnel will successfully complete an entry medical examination or demonstrate that they currently participate in a regular (i.e., annual) medical monitoring program that satisfies project-specific guidelines and the applicable OSHA requirements.

All personnel hired specifically for the project who will work in the exclusion or contamination reduction zones will be included in a similarly compliant medical monitoring program (in addition to OSHA compliant training). Acceptable medical monitoring for site hires will include pre-job, post-job, and routine 12 month examinations during work at the site.

The minimum acceptable medical examinations for this project include all the requirements of 29 CFR 1910.120, including the following:

- Past Medical History - On entry to the program, information concerning past occupational and personal medical history, as well as family history of disease;
- Present Medical Profile - All pertinent medical information regarding present state of health and during each year of field work in hazardous material projects;
- Exposure History - Information concerning the cumulative duration of time spent on potentially hazardous sites, the primary toxic substances, and the levels of protection employed by each site;
- Laboratory Analyses - Hematology, liver and kidney function tests, and urinalysis;
- Physical Examination;
- Hearing Test;
- Vision Test; and
- Pulmonary Function Test.

Optional tests, if recommended by the examining physician include:

- Electrocardiogram;
- Chest X-ray; and
- Special Tests - Medical information concerning the effects of exposure to specific contaminants.

In addition, all individuals who enter the Exclusion Zone will be tested for drug usage in accordance with the contract requirements. Each individual will be required to acknowledge and consent to this testing requirement by reading and signing the Substance Abuse Policy Statement, which is included as Figure 3-1. EPA and IDEM employees and their contractors acknowledge the existence of the policy, but will not be required to submit to drug testing.

Medical clearance forms stating that the individual is cleared for hazardous waste work, in accordance with 29 CFR 1910.120, and respiratory protection, in accordance with 29 CFR 1910.134, will be kept on site for all employees working in an exclusion or contamination reduction zone.

Figure 3-1. Substance Abuse Policy Statement

SUBSTANCE ABUSE POLICY STATEMENT

The use of, possession of, being under the influence of, or the presence in a person's system of any unlawful drug, alcoholic beverage, or excessive prescription drug at any Work location is prohibited. Unlawful drugs include, among others, marijuana, hashish, heroin, cocaine, and hallucinogens. Depressants and stimulants not prescribed for current personal treatment by a licensed physician or in excess of prescribed dosage are also prohibited.

Entry into the Site where any Work is or may be conducted or any associated offices constitutes consent to search the entrant's personal effects and vehicle for any such unauthorized substances or any paraphernalia involved in their use.

Drug screening programs may be utilized to ensure compliance with this policy. I hereby consent to submit, if requested to do so, to medical screening and medical testing to verify that I am not in violation of this policy. Additionally, I will honestly provide all medical history necessary or appropriate to carry out this policy and, if requested, provide authorization to my physician to disclose all information relevant to the carrying out of this policy.

Violation of this Substance Abuse Policy Statement or refusal to submit to a search of drug screening test will be cause for disciplinary action, including immediate termination of employment.

I HAVE READ AND , IN EXCHANGE FOR BEING PERMITTED TO WORK AT THE SITE, AGREE TO THE ABOVE POLICY.

____________________ ____________________ __________

Employee Signature Employed By Date

VERIFIED BY: ____________________
(Project Manager's Firm Name)

By: ______________________________

Title: ______________________________ Date: _______________

Figure 3-2. Substance Abuse Policy Statement for EPA and IDEM Employees

SUBSTANCE ABUSE POLICY STATEMENT

The use of, possession of, being under the influence of, or the presence in a person's system of any unlawful drug, alcoholic beverage, or excessive prescription drug at any Work location is prohibited. Unlawful drugs include, among others, marijuana, hashish, heroin, cocaine, and hallucinogens. Depressants and stimulants not prescribed for current personal treatment by a licensed physician or in excess of prescribed dosage are also prohibited.

Entry into the Site where any Work is or may be conducted or any associated offices constitutes consent to search the entrant's personal effects and vehicle for any such unauthorized substances or any paraphernalia involved in their use.

Drug screening programs may be utilized to ensure compliance with this policy. I hereby consent to submit, if requested to do so, to medical screening and medical testing to verify that I am not in violation of this policy. Additionally, I will honestly provide all medical history necessary or appropriate to carry out this policy and, if requested, provide authorization to my physician to disclose all information relevant to the carrying out of this policy.

Violation of this Substance Abuse Policy Statement or refusal to submit to a search of drug screening test will be cause for disciplinary action, including immediate termination of employment.

I HAVE READ AND AGREE TO THIS POLICY STATEMENT, WITH THE EXCEPTION THAT I DECLINE TO SUBMIT TO DRUG TESTING.

______________________	______________________	____________
Government Employee Signature	Employed By	Date

VERIFIED BY: ______________________
(Project Manager's Firm Name)

By: ______________________

Title: ______________________ Date: ______________

4.0 EMPLOYEE, SUPERVISOR, AND VISITOR TRAINING

All personnel will meet health and safety training regulations outlined in 29 CFR 1910.120, as well as other applicable sections. OSHA 1910.120 training for all exclusion zone and contamination reduction zone workers will include 40-hour introductory, refresher, and supervisory training, as necessary. Site visitors who fall under OSHA's 24-hour training provisions and have adequate training and medical clearance may be admitted to certain work areas, as approved by the SHSO and the HSO.

To comply with OSHA's site-specific training requirements, the SHSO will conduct a training session immediately preceding an individual's participation in field activities. This initial training will also fulfill other OSHA requirements, including Hazard Communication. Any need for additional site-specific or job-specific training will be conducted by the SHSO. The SHSO will also be responsible for daily safety briefings for on-site personnel and for "visitor" site briefings.

4.1 Site-Specific Training

The minimum content of the site-specific training program, which includes instructions concerning potential hazards, is outlined below:

- Identification of hazardous chemicals and physical agents previously identified at the Site
  - Definition of hazardous materials
  - Classification of hazardous materials
- Toxicological and physical properties of these contaminants
  - Expected exposure levels
  - Routes of probable exposure
    - Respiratory tract
    - Dermal penetration
    - Ingestion
  - Expected toxic effects
  - ACGIH threshold limit levels
  - Carcinogens
- Emergency planning and principles to be used on the job site
  - Emergency medical care and treatment
  - General safety practices

- Emergency telephone numbers
- On-site communications
- Names and responsibilities of key project safety personnel

▸ Respiratory protection level used on-site

  - General principles
  - Potential hazards
  - Protective measures provided by air monitoring
  - Response (evacuation) requirements activated by abnormally high volatile organics in ambient air

▸ Protective clothing requirements

  - Level of protection
  - Articles of protective clothing
  - Purpose of each article of protective clothing
  - Proper use of protective clothing

▸ Decontamination

  - Concern regarding proper decontamination
  - Extent of decontamination required
  - Personnel decontamination under normal conditions
  - Personnel decontamination during medical emergencies
  - Decontamination of equipment
  - Disposal of contaminated materials

Personnel will be required to sign a document at the conclusion of the training program stating that they understand and will abide by the provisions found in this HSP.

4.2 Daily Safety "Tailgate" Meeting

Each day prior to the start of work activities, all site personnel will meet and sign an attendance sheet. At this time, the SHSO will indicate the work scheduled for the day and what level of protection will be required. Also, any need for changes in safety procedures will be addressed. The crews will be asked to discuss any concerns they have regarding health and safety.

All topics covered in the meeting will be documented and posted for the day in the safety office.

5.0 HAZARD ASSESSMENT

5.1 Chemical Hazards

Previous site investigations have indicated the presence of various volatile and semi-volatile organic compounds (VOCs and SVOCs), metals, and PCBs in the soil and groundwater at the ECC site. These compounds were detected during either the Remedial Investigation (CH2M Hill, 1986) or Supplemental Investigations (Dow Environmental Inc., 1993 and 1995). Using the data from these previous investigations at the Enviro-Chem site, Versar developed a chemical hazard analysis summary, which is included as Table 5-1. This table lists all chemicals detected at the site above background concentrations that may represent potential health hazards. It is important to note that interim removal actions have already been conducted at the Enviro-Chem site, and consequently, the existing concentrations may already be significantly lower than the maximum concentrations detected during the previous investigations for the individual constituents reported on Table 5-1. Based on this data, the following contaminants are believed to be present:

<u>Volatiles</u>	<u>Semivolatiles</u>
1,1,1-Trichloroethane	Phenol
1,1-Dichloroethane	Isophorone
1,2-Dichloroethene (total)	Naphthalene
1,1,2-Trichloroethane	bis(2-ethylhexyl)phthalate
Chloroform	di-n-butyl phthalate
1,1-Dichloroethene	Diethyl phthalate
trans-1,2-Dichloroethene	Dimethyl phthalate
Ethylbenzene	Butyl benzyl phthalate
Methylene chloride	1,2-Dichlorobenzene
Tetrachloroethene	
Toluene	
Trichloroethene	
Acetone	
2-Butanone	
4-Methyl-2-pentanone	
Xylenes (Total)	
Vinyl Chloride	

Dust, created on-site, may be significant health threat both in and of itself (e.g., silica and rock dust from concrete crushing) or as a "carrier" for other organic chemical agents, including those of heavier molecular weights (e.g., PCBs, naphthalene, and phenol). The significance of dust exposure is the reason that combination cartridges (organic vapor/acid gas and HEPA) will be used whenever respiratory protection is indicated.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Volatiles					
Acetone	MW: 58.09 MP: -94.6°C BP: 56.48°C Flash: 0°F VP: 400 mm @ 39.5°C	GW: 15.8 SW: 1.1 SL: 650	750 ppm	20,000 ppm	Low toxicity via oral and inhalation exposure; very low toxicity via dermal exposure. Toxicity effects include eye and skin irritation and central nervous system effects. Narcotic in high concentrations. Causes irritated eyes, nose, and throat; headache; dizziness; and dermatitis.
Chloroform	MW: 119.37 MP: -63.5°C BP: 61.26°C Flash: None VP: 100 mm @ 10.4°C	GW: 5.3 SW: ND SL: 41.8	2 ppm	1,000 ppm	Suspected human carcinogen. High toxicity via oral exposure and low toxicity effects from inhalation exposure. Toxicity effects include systemic and central nervous system effects in humans. Causes irritation of the conjunctiva, dilation of the pupils, and anesthetic effects. Prolonged inhalation exposure causes paralysis, cardiac/respiratory failure, narcosis, and damage to liver, heart, and kidneys.
Chloroethane	MW: 40.49 Flash: -58°F	GW: 0.29 SW: 0.012 SL: ND	1,000 ppm	20,000 ppm	Causes incoordination, muscle cramps, cardiac arryhthmia, cardiac arrest, and liver and kidney damage through inhalation, oral, and dermal exposure.
1,1-Dichloroethane	MW: 98.96 MP: -97.7°C BP: 57.3°C Flash: 22°F VP: 230 mm @ 25°C	GW: 5.7 SW: 0.045 SL: 0.70	100 ppm	4,000 ppm	Moderat toxicological effects from oral exposure in rats and dermal exposure in rabbits. Liver damage is reported in experimental animals. Exposure causes central nervous system depression, skin irritation, drowsiness, unconsciousness, and liver and kidney damage.
1,1-Dichloroethene	MW: 96.94 BP: 31.6°C Flash: 0°F	GW: 0.31 SW: ND SL: 35.0	5 ppm	NA	A suspected carcinogen with high acute toxicological effects from oral and inhalation exposure.
1,2-Dichloroethane	MW: 98.96 Flash: 55.4°F	GW: 0.067 SW: ND SL: 0.280	1 ppm	1,000 ppm Ca	A suspected human carcinogen. Causes central nervous system depression, nausea, vomiting, dermatitis, eye irritation, and corneal opacity.
1,2-Dichloroethene	MW: 96.94 MP: -80.5°C BP: 59°C Flash: 39°F VP: 400 mm @ 41.0°C	GW: 72 SW: ND SL: 120	200 ppm	4,000 ppm	Low toxicity effects via oral exposure route. In high concentrations, it is an irritant and narcotic. Has also produced liver and kidney injury in experimental animals. Irritates eyes and causes central nervous system depression.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Ethyl Benzene	MW: 106.18 BP: 136.2°C MP: -94.9°C Flash: 59°F VP: 10 mm @ 25.9°C	GW: 0.47 SW: 0.013 SL: 5,649	100 ppm	2,000 ppm	Moderate skin, eye, and mucous membrane irritant via oral and inhalation exposure routes. Experimental teratogen. Dermal contact causes erythema and inflammation of the skin. Acute exposure to vapor causes lachrymation, irritation of the nose and throat, dizziness, and a sense of constriction of the chest.
Methylene Chloride	MW: 84.93 BP: 39.8°C MP: -96.7°C VP: 380 mm @ 22°C	GW: 12 SW: 0.086 SL: 515	50 ppm	5,000 ppm	Suspected human carcinogen. Produces central nervous system and blood toxicity effects in humans. Moderate to high toxicity via oral exposure route and low to moderate toxicity via inhalation route. Very dangerous to eyes. Induces narcosis. Symptoms of exposure include paresthesia of the extremities, accelerated pulse rate, head congestion, a sense of heat, irritation of the eyes, and nausea. Causes dermatitis upon prolonged skin contact.
MEK (2-Butanone)	MW: 129.19	GW: 0.026 SW: 0.560 SL: 2,800	200 ppm	3,000 ppm	Causes irritation of eyes, nose, and throat; headaches; dizziness; and vomiting.
MIBK (4-Methyl-2 Pentanone)	MW: 100.18 BP: 118°C MP: -80.2°C Flash: 62.6°F VP: 16 mm @ 20°C	GW: ND SW: ND SL: 190	50 ppm	3,000 ppm	Moderate toxicity effects from oral and inhalation exposure. High irritant toxicity to eyes and mucous membranes. Narcotic effects in high concentrations.
Styrene	MW: 104.16 BP: 146°C MP: -31°C Flash: 88°F	GW: 0.005 SW: ND SL: 19.0	50 ppm	5,000 ppm	Suspected carcinogen. High oral toxicity effects and moderate toxicity effects from inhalation. Causes irritation and central nervous system effects in humans. Can cause irritation, violent itching of the eyes, lachrymation, and severe human eye injuries. May also cause narcosis.
Tetrachlorethene	MW: 165.82 BP: 121.2°C MP: -23.35°C Flash: None VP: 15.8 mm @ 22°C	GW: 13 SW: 0.029 SL: 4,116	25 ppm	500 ppm Ca	Known carcinogen. Moderate toxicity effects via inhalation, oral, and dermal exposure routes. Vapor is irritating to eyes, nose, throat. Liquid is a skin and eye irritant. High vapor concentrations will cause lachrymation and burning of the eyes, irritation of the nose and throat, and possibly nausea, vomiting, drowsiness, and narcosis. May also cause difficulty in breathing followed by death.
Toluene	MW: 92.15 MP: -95°C BP: 110.4°C Flash: 40°F VP: 36.7 mm @ 30°C	GW: 7.2 SW: 0.082 SL: 2,000	100 ppm	2,000 ppm	Moderate toxicity from inhalation exposure, and low toxicity from oral and dermal exposure. Vapor is irritating to eyes, nose, and throat; liquid is irritating to the skin and eyes. Causes narcosis, nausea, vomiting, headache, dizziness, difficulty breathing, and loss of consciousness.
trans-1,2-Dichloroethane	MW: 96.94 Flash: 35.6°F	GW: 4.0 SW: 0.33 SL: 79.7	NA	NA	Causes dizziness, nausea, vomiting, and loss of consciousness.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
1,1,1-Trichloroethane	MW: 133.40 BP: 74.1°C MP: -32.5°C Flash: None VP: 100 mm @ 20.0°C	GW: 64 SW: 0.12 SL: 7,411	350 ppm	1,000 ppm	In humans, it causes psychotropic, gastrointestinal, and central nervous system effects. Moderate skin irritant and a severe eye irritant. Narcotic in high concentrations. Causes proarrhythmic activity; irritation to eyes, nose, throat, and skin; dizziness; nausea; and difficulty breathing.
1,1,2-Trichloroethane	MW: 133.40 BP: 114°C MP: -35°C VP: 40 mm @ 35.2°C	GW: 0.12 SW: ND SL: 0.556	10 ppm	500 ppm	Suspected carcinogen. Moderate oral, inhalation, and dermal exposure toxicity effects. Has narcotic properties and acts as a local irritant to eyes, nose, and lungs. May also be injurious to liver and kidneys.
Trichloroethene	MW: 131.38 BP: 86.7°C MP: -73°C Flash: 89.6°F VP: 100 mm @ 32°C	GW: 28 SW: 0.24 SL: 6,080	50 ppm	1,000 ppm Ca	Known carcinogen. A strong skin and eye irritant. Moderate toxicity from inhalation exposure, and low toxicity from oral and dermal exposure. Vapor is irritating to eyes, nose, and throat; liquid is irritating to the skin and eyes. Causes narcosis, nausea, vomiting, headache, dizziness, difficulty breathing, and loss of consciousness.
Trichlorofluoromethane	MW: 137.36 BP: 24.1°C MP: -111°C	GW: 0.10 SW: ND SL: 0.001	1,000 ppm	10,000 ppm Ca	Suspected carcinogen. Low toxicity effects from inhalation exposure. Causes eye and peripheral nervous system effects in humans. High concentrations cause narcosis, anesthesia, dizziness, and difficulty breathing.
Vinyl Chloride	MW: 62.50 BP: -13.9°C MP: -160°C Flash 17.6°F VP: 2,600 mm @ 25°C	GW: 0.34 SW: 0.011 SL: 6.4	1 ppm	Ca	Known human carcinogen. High irritation effects to skin, eyes, and mucous membranes via inhalation exposure. Causes skin burns and anesthetic effects in high concentrations. Symptoms of exposure include eye, nose, and throat irritation; dizziness; and difficulty breathing.
Total Xylenes	MW: 106.18 BP: 138.5°C MP: -47.9°C Flash: 100°F VP: 6.72 mm @ 21°C	GW: 3.4 SW: 0.047 SL: 6,800	100 ppm	10,000 ppm	Moderate toxicological effects via inhalation and oral exposure routes. Very little dermal toxicity. Irritating to eyes, nose, and throat. May cause headaches, nausea, vomiting, difficulty breathing, or loss of consciousness in high concentrations.
Base Neturals/Acid Extractables					
bis (2-Ethylhexyl) Phthalate	MW: 390.62	GW: 0.099 SW: ND SL: 3,800	5 mg/m^3	Ca	Possible human carcinogen. Low toxicity effects from oral and dermal exposure. Mild skin and eye irritant. May also cause gastrointestinal effects in humans.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Benzoic Acid	MW: 122.13 BP: 249°C MP: 121.7°C Flash: 250°F VP: 1 mm @ 96°C	GW: ND SW: ND SL: 28.2	NA	NA	High toxicity effects via vapor inhalation exposure. A moderate human skin irritant.
Butylbenzylphthalate	MW: 312.39 BP: 370°C MP: <-35°C Flash: 390°F	GW: 0.011 SW: ND SL: 1,282	NA	NA	Moderate toxicological effects from inhalation exposure.
1,2-Dichlorobenzene	MW: 147.00 BP: 180°C MP: -17.5°C Flash: 151 °F	GW: 0.067 SW: ND SL: 2,160	50 ppm	1,700 ppm	A potential carcinogen. Moderate toxicity via inhalation and oral exposure routes. Causes irritation to eyes, skin, and mucous membranes, as well as liver and kidney damage.
1,4-Dichlorobenzene	MW: 147.00 BP: 173.4°C MP: 53°C Flash: 150°F VP: 10 mm @ 54.8°C	GW: ND SW: ND SL: 570	75 ppm	1,000 ppm	A potential carcinogen. Moderate toxicity via inhalation and oral exposure routes, and high toxicity from oral exposure. Has been reported to cause liver injury in humans. Causes headaches, eye irritation, nausea, vomiting, and jaundice.
Diethyl Phthalate	MW: 222.26 BP: 302°C MP: -40.5°C Flash: 325°F	GW: 0.40 SW: ND SL: 3.5	5 mg/m^3	NA	Moderate toxicity from oral exposure, and low toxicity effects from inhalation exposure. Causes eye irritation. Also causes narcosis and irritation of mucous membranes in high concentrations. No known serious harmful effects from acute exposure.
2,2-Dimethylphenol	MW: 122.18	GW: ND SW: ND SL: 88.0	NA	NA	NA
2,4-Dimethylphenol	MW: 122.18	GW: 0.077 SW: ND SL: ND	NA	NA	Irritating to eyes, nose, throat, and skin. May cause nausea and vomiting.
Dimethylphthalate	MW: 194.20 BP: 283.7°C Flash: 295°F VP: 1 mm @ 100.3°C	GW: 0.014 SW: ND SL: 1,300	5 mg/m^3	9,300 mg/m^3	An eye irritant with moderate toxicological effects from oral exposure and low toxicological effects from inhalation exposure. Irritates nasal passages, upper respiratory tract, stomach, and eyes.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Di-n-Butyl Phthalate	MW: 278.38 BP: 340°C MP: -35°C Flash: 315°F	GW: ND SW: ND SL: 112	5 mg/m^3	9,300 mg/m^3	Low oral and inhalation toxicity effects. Causes eye irritation, irritation of nasal passages, upper respiratory effects, stomach discomfort, and light sensitivity.
Di-n-Octyl Phthalate	MW: 390.62	GW: ND SW: ND SL: 300	5 mg/m^3	NA	Low acute toxicity effects. Causes skin and eye irritation.
1,2-Diphenylhydrazine	MW: 184.26 MP: 131°C	GW: ND SW: ND SL: 68.6	NA	Ca	A suspected human carcinogen.
Hexachlorbutadiene	MW: 260.74	GW: ND SW: ND SL: 5.0	0.02 ppm	Ca	A suspected human carcinogen. High toxicity effects noted from both oral and inhalation exposure. A mild skin and eye irritant in rabbits.
Isophorone	MW: 138.23 BP: 215.2°C Flash: 184°F VP: 1 mm @ 38.0°C	GW: 0.12 SW: 0.24 SL: 409	4 ppm	800 ppm	A skin and eye irritant with moderate toxicity effects via oral, inhalation, and dermal exposure. It is a kidney poison and can cause irritation, lachrymation, possible opacity of the cornea, and necrosis of the cornea.
2-Methylnaphthalene	MW: 142.21 BP: 241.1°C MP: 34.58°C	GW: ND SW: ND SL: 130	NA	NA	Testing shows low toxicity via oral exposure route.
2-Methylphenol	MW: 108.15 MP: 30.8°C BP: 190.8°C Flash: 178°F VP: 1 mm @38.2°C	GW: ND SW: 0.027 SL: 143	5 ppm	250 ppm	High toxicity effects via oral exposure, and moderate toxicity effects via dermal exposure. It has a corrosive action on the skin and mucous membranes, producing severe chemical burns and dermatitis.
4-Methylphenol	MW: 108.15 MP: 35.5°C BP: 201.8°C Flash: 202°F VP: 1 mm @ 53°C	GW: ND SW: 0.12 SL: 536	5 ppm	250 ppm	High toxicity effects via oral exposure, and moderate toxicity effects via dermal exposure. It has a corrosive action on the skin and mucous membranes, producing severe chemical burns and dermatitis. Severe eye irritant.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Naphthalene	MW: 128.18 MP: 80.1°C BP: 217.9°C Flash: 174°F VP: 1 mm @ 52.6°C	GW: 0.028 SW: ND SL: 470	10 ppm	500 ppm	Moderate oral and low dermal exposure toxicity effects. Systemic reactions include nausea, headache, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, convulsions, and coma. Poisoning may occur by ingestion of large doses, inhalation, or skin absorption. A skin and eye irritant.
Nitrobenzene	MW: 123.12 MP: 6°C BP: 210°C Flash: 190°F VP: 1 mm @ 44.4°C	GW: ND SW: ND SL: 7.8	1 ppm	200 ppm	Moderate toxicity via oral and dermal exposure. A skin and eye irritant. Causes cyanosis due to formation of methemoglobin. Rapidly absorbed through skin. Causes headache, drowsiness, nausea, and vomiting.
N-Nitrosodimethylamine	MW: 74.10 BP: 154°C	GW: ND SW: ND SL: 9.9	NA	Ca	Suspected human carcinogen. Has caused fatal liver diseases in humans.
N-Nitrosodiphenylamine	MW: 198.24 MP: 144°C	GW: ND SW: ND SL: 1.4	NA	NA	An eye irritant and experimental carcinogen in rats.
N-Nitrosodipropylamine	MW: 130.22	GW: ND SW: ND SL: 12.0	NA	Ca	A suspected human carcinogen.
Phenol	MW: 94.12 MP: 40.6°C BP: 181.9°C Flash: 175°F VP: 1 mm @ 40.1°C	GW: 0.140 SW: ND SL: 570	5 ppm	100 ppm	A skin and eye irritant which is rapidly absorbed through the skin. Acute phenol poisoning causes central nervous system effects. Death results from skin absorption very rapidly; where death is delayed, damage to kidneys, liver, pancreas, spleen, and edema of lungs may result. Causes headache, dizziness, muscular weakness, dimness of vision, ringing in the ears, irregular and rapid breathing, weak pulse, dyspnea, followed by loss of consciousness, collapse, and death. Ingestion also causes nausea, with or without vomiting, severe abdominal pain, and corrosion of the lips, mouth, throat, esophagus, and stomach.
Tricholorobenzene	MW: 181.44 MP: 17°C BP: 213°C Flash: 230°F VP: 1 mm @ 38.4°C	GW: ND SW: ND SL: 390	5 ppm	NA	Moderate skin irritant.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Inorganics					
Aluminum	MW: 26.98 MP: 660°C BP: 2450°C VP: 1 mm @ 1284°C	GW: 61.5 SW: NA SL: 44,800	10 mg/m^3	NA	Not generally regarded as an industrial poison. Inhalation of fine powder has been reported to cause pulmonary fibrosis.
Antimony	MW: 121.75 MP: 630°C BP: 1635°C VP: 1 mm @ 866°C	GW: 0.004 SW: NA SL: 42	0.5 mg/m^3	80 mg/m^3	Most antimony compounds are highly toxic via oral and inhalation exposure routes. Causes irritation of the skin and mucous membranes; inflammation of the nose and throat; metallic taste; gastrointestinal upset with vomiting and diarrhea; and various nervous complications, including irritability, sleeplessness, fatigue, dizziness, and muscular pain.
Arsenic	MW: 74.92 MP: 814°C @ 36 atm BP: sublimes @ 612°C VP: 1 mm @ 372°C	GW: 0.015 SW: NA SL: 20	0.010 mg/m^3	Ca	Confirmed human carcinogen. Causes skin and gastrointestinal effects in humans. Acute poisoning results in marked irritation of the stomach and intestines, with nausea, vomiting, and diarrhea. May also cause collapse, shock, rapid pulse, cold sweat, coma, and death.
Barium	MW: 137.36 MP: 725°C BP: 1640 °C VP: 10 mm @ 1049°C	GW: 1.0 SW: NA SL: 1,730	0.5 mg/m^3	250 mg/m^3	The soluble barium salts are poisonous when ingested. Causes irritation of the eyes, nose, throat, and skin, producing dermatitis, as well as severe abdominal pain, with vomiting, dyspnoea, rapid pulse, paralysis of arms and legs, cyanosis, and death.
Cadmium	MW: 112.40 MP: 320.9°C BP: 767°C VP: 1 mm @ 394°C	GW: ND SW: NA SL: 27	0.05 mg/m^3	40 mg/m^3 Ca	Suspected human carcinogen. A human systemic toxicant with high toxicity effects from inhalation and oral exposure. Primarily effects the respiratory tract and kidneys, causing pulmonary edema and death. Inhalation causes dryness of the throat, cough, headache, a sense of constriction of chest, shortness of breath, and vomiting. Oral exposure causes nausea, salivation, vomiting, diarrhea, and abdominal pain.
Calcium	MW: 40.08 MP: 842°C BP: 1484°C VP: 10 mm @ 983°C	GW: 161 SW: NA SL: 126,000	2 mg/m^3 (oxide) 10 mg/m^3 (carbonate, silicate, and sulfate)	250 mg/m^3	Generally speaking, calcium compounds are not toxic. Calcium oxide does cause irritation of the skin, eyes, and mucous membranes.
Chromium	MW: 52.0	GW: 0.145 SW: NA SL: 145	0.5 mg/m^3	250 mg/m^3	Suspected human carcinogen. Chromic acid and its salts have a corrosive action on the skin and mucous membranes, and cause fibrosis of the lungs.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Cobalt	MW: 58.93 MP: 1495°C BP: 2000°C	GW: 0.080 SW: NA SL: 51	0.05 mg/m^3	20 mg/m^3	Suspected human carcinogen. Causes cough, decreased pulmonary function, dyspnea, dermatitis, diffuse nodular fibrosis, and respiratory hypersensitivity.
Copper	MW: 63.54 MP: 1083°C BP: 2324°C VP: 1 mm @ 1628°C	GW: 0.106 SW: NA SL: 167	1 mg/m^3	NA	High toxicity effects via oral exposure. Chloride and sulfate compounds cause irritation of the skin and eyes. Oxide is irritant to the eyes and upper respiratory tract. Sulfate in large doses causes vomiting, gastric pain, dizziness, exhaustion, anemia, cramps, convulsions, shock, coma, and death. Kidney and liver damage have also been reported.
Iron	MW: 55.8 MP: 1535°C BP: 3000°C VP: 1 mm @ 1787°C	GW: 105 SW: NA SL: 147,000	1 mg/m^3 (salts) 5 mg/m^3 (oxide)	NA	Suspected carcinogen of lung, liver, and connective tissue. Iron dust causes conjunctivitis, retinitis, and siderosis of tissues. Can also cause pulmonary fibrosis.
Lead	MW: 207.19 MP: 327.43°C BP: 1740°C VP: 1 mm @ 973°C	GW: 0.102 SW: NA SL: 432	0.050 mg/m^3	NA	Lead chromate is a suspected human carcinogen of the lungs and kidneys. Causes central nervous system effects in humans. High toxicity via oral exposure route; moderate irritant. Symptoms of lead poisoning include abdominal pain, constipation and/or diarrhea, loss of apetite, metallic taste, nausea and vomiting, lassitude, insomnia, weakness, joint and muscle pain, irritability, headache, and dizziness.
Magnesium	MW: 24.31 MP: 651°C BP: 1100°C VP: 1 mm @ 621 °C	GW: 132 SW: NA SL: 292,000	10 mg/m^3 (oxide)	NA	High toxicity via oral exposure route. May cause metal fume fever. Elemental magnesium burns the skin and eyes.
Manganese	MW: 54.94 MP: 1260°C BP: 1900°C VP: 1 mm @ 1292°C	GW: 1.93 SW: NA SL: 6,870	5 mg/m^3	10,000 mg/m^3	Exposure occurs via inhalation of dust or fumes, and causes central nervous system effects, including languor, sleepiness, weakness, emotional disturbance, spastic gait, and paralysis.
Nickel	MW: 58.71 MP: 1455°C BP: 2730°C VP: 1 mm @ 1810°C	GW: 0.176 SW: NA SL: 164	1 mg/m^3	Ca	Confirmed human carcinogen. Causes dermatitis, allergic asthma, and pneumonitis.
Potassium	MW: 39.10 MP: 63.65°C BP: 774°C	GW: 106 SW: NA SL: 10,500	NA	NA	The toxicity of potassium compounds is almost always that of the anion.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Silver	MW: 107.87 MP: 961.93°C BP: 2212°C	GW: 0.033 SW: NA SL: 3.8	0.01 mg/m^3	NA	A human skin irritant. Also causes irritation of the nasal septum and throat.
Sodium	MW: 22.99 MP: 97.81°C BP: 881.4°C VP: 1.2 mm @ 400°C	GW: 381 SW: NA SL: 15,600	NA	NA	Elemental sodium burns skin and eyes by reacting violently with their moisture. Sodium cation is practically non-toxic.
Vanadium	MW: 50.94 MP: 1917°C BP: 3000°C	GW: ND SW: NA SL: 37	0.05 mg/m^3	70 mg/m^3	Compounds act chiefly as irritants to the conjunctivae and respiratory tract. Symptoms include red blood cell destruction, anemia, loss of appetite, pallor and emaciation, albuminuria, and homaturia. Outward signs of exposure include gastrointestinal disorders, nervous complaints, and cough.
Zinc	MW: 65.37 MP: 419.8°C BP: 908°C VP: 1 mm @ 487°C	GW: 0.276 SW: NA SL: 650	5 mg/m^3 (oxide)	NA	Zinc chromate is a confirmed human carcinogen. Zinc oxide is an eye and skin irritant. Zinc dust is non-toxic to humans via inhalation exposure. Oxide causes sweet taste, throat dryness, cough, weakness, generalized aching, fever, nausea, and vomiting. Chloride compound may cause lung damage.
Total Cyanides (CN^-)	MW: 26.02	GW: 0.006 SW: NA SL: 4.4	5 mg/m^3	50 mg/m^3	Directly stimulates the chemoreceptors of the cartoid and aortic bodies with resultant hyperpnea. Death is caused due to respiratory arrest of central origin. Cyanides are readily absorbed through all routes of exposure, including through skin, mucous membranes, and inhalation. Symptoms of cyanide exposure include a bitter burning taste, salivation, nausea without vomiting, anxiety, confusion, vertigo, giddiness, lower jaw stiffness, convulsions, opisthotonos, paralysis, coma, cardiac arrhythmia, and respiratory failure.
Pesticide/PCB's					
Total PCBs	BP: 340-375°C Flash: 383°F	GW: 0.0006 SW: ND SL: 37.8	0.5 mg/m^3	5 mg/m^3 Ca	Suspected human carcinogen. Causes skin and liver damage. Skin irritation is manifested as chloracne. May also cause nausea, vomiting, loss of weight, jaundice, edema, and abdominal pain.
Aldrin	MW: 346.90 MP: 104-105°C	GW: ND SW: ND SL: 0.02	0.25 mg/m^3	100 mg/m^3 Ca	Suspected human carcinogen. High central nervous system toxicity effects from oral and dermal exposure routes. Exposure can cause irritability, convulsions, and depression. Prolonged exposure causes liver damage. Symptoms of exposure also include headache, dizziness, nausea, vomiting, and malaise.
Chlordane	MW: 409.76 BP: 175°C	GW: ND SW: ND SL: 2.7	0.5 mg/m^3	500 mg/m^3	An experimental carcinogen. High toxicity effects via oral exposure route, and moderate toxicity effects via dermal exposure route. A central nervous system stimulant which is readily absorbed through the skin. Causes skin and eye irritation, convulsions, liver damage, respiratory failure, and death.

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
4,4-DDD	MW: 320.04 MP: 110°C	GW: ND SW: ND SL: 5.9	NA	NA	An experimental carcinogen with high toxicity effects from oral exposure and moderate toxicity effects via dermal exposure. Irritating to skin, eyes, nose, and throat.
4,4-DDE	NA	GW: ND SW: ND SL: 0.83	NA	NA	Degradation product of DDT. High toxicity effects via oral and dermal exposure routes. Absorbed through the lungs and intestinal tract and causes central nervous system effects. Causes vomiting, diarrhea, numbness, partial paralysis of extremities, mild convulsions, loss of proprioception and vibratory sensation of the extremities, and hyperactive knee jerk reflexes.
4,4-DDT	MW: 354.48 MP: 108.5°C	GW: ND SW: ND SL: 36	1 mg/m^3	Ca	Suspected human carcinogen. High toxicity effects via oral and dermal exposure routes. Absorbed through the lungs and intestinal tract and causes central nervous system effects. Causes vomiting, diarrhea, numbness, partial paralysis of extremities, mild convulsions, loss of proprioception and vibratory sensation of the extremities, and hyperactive knee jerk reflexes.
Delta-BHC	MW: 290.82	GW: ND SW: ND SL: 0.76	0.5 mg/m^3	1,000 mg/m^3	Moderate toxicity effects from oral exposure. Causes dizziness, slight nausea, headache, diarrhea, pressure in temples, and irritation of eyes, nose, and throat. Also causes central nervous system stimulation followed by convulsions and later depression.
Dieldrin	MW: 380.90 MP: 150°C	GW: ND SW: ND SL: 0.70	0.25 mg/m^3	450 mg/m^3 Ca	Suspected human carcinogen. High toxicity effects via oral and dermal exposure routes. Absorbed through the lungs and intestinal tract and causes central nervous system effects. Causes headache, nausea, general malaise, dizziness, vomiting, diarrhea, numbness, partial paralysis of extremities, mild convulsions, loss of proprioception and vibratory sensation of the extremities, and hyperactive knee jerk reflexes.
Endosulfan I	MW: 406.91 MP: 106°C	GW: ND SW: ND SL: 8.3	0.1 mg/m^3	NA	Very, very high toxicity effects via oral exposure, and very high toxicity effects via dermal exposure. A central nervous system stimulant producing convulsions, nausea, vomiting, headache, dizziness, and abdominal discomfort.
Endosulfan II	MW: 406.91 MP: 212°C	GW: ND SW: ND SL: 11.1	0.1 mg/m^3	NA	Very, very high toxicity effects via oral exposure, and very high toxicity effects via dermal exposure. A central nervous system stimulant producing convulsions, nausea, vomiting, headache, dizziness, and abdominal discomfort.
Endosulfan Sulfate	NA	GW: ND SW: ND SL: 19	NA	NA	NA

Table 5-1. Enviro-Chem Chemical Substance Hazard Analysis (Continued)

Substance	Physical Properties[1]	Maximum Concentrations (ppm)[2]	ACGIH TLV/OSHA PEL[3]	IDLH[4]	Primary Hazards and Symptoms/Effects of Exposure
Endrin	MW: 380.90 MP: 200°C	GW: ND SW: ND SL: 11.2	0.1 mg/m^3	200 mg/m^3	Very, very high toxicity effects via oral exposure, and very high toxicity effects via dermal exposure. A eye, nose, and throat irritant and central nervous system stimulant producing convulsions, nausea, vomiting, headache, dizziness, and abdominal discomfort.
Endrinaldehyde	NA	GW: ND SW: ND SL: 20	NA	NA	NA
Heptachlor	MW: 373.30 MP: 96°C	GW: ND SW: ND SL: 0.21	0.5 mg/m^3	100 mg/m^3	An experimental carcinogen. High toxicity effects via oral exposure, and moderate toxicity effects via dermal exposure. Acute exposure causes liver damage. Symptoms of acute exposure include tremors, convulsions, kidney damage, respiratory collapse, and death.
Lindane	MW: 290.82	GW: ND SW: ND SL: 0.17	0.5 mg/m^3	1,000 mg/m^3	Moderate toxicity effects from oral exposure. Causes dizziness, slight nausea, headache, diarrhea, pressure in temples, and irritation of eyes, nose, and throat. Also causes central nervous system stimulation followed by convulsions and later depression.
Toxaphene	MW: 413.80 MP: 65-90°C	GW: ND SW: ND SL: 10.8	0.5 mg/m^3	200 mg/m^3	A suspected carcinogen with high toxicity effects from oral and inhalation exposure, and moderate toxicity effects from dermal exposure. A mild skin and eye irritant. Causes central nervous system stimulation, including excitability with tremors, convulsions, and death from respiratory failure. Liver damage has also been reported.

NOTES:

NA - Not available or not analyzed.

[1] Physical properties include MW - molecular weight (equivalent to atomic weight for elemental metals), MP - melting point, BP - boiling point, Flash - flash point, and VP - vapor pressure.

[2] Maximum concentrations detected at the Enviro-Chem site during the Remedial Investigation or supplemental investigations in GW - groundwater, SW - surface water, and SL - soil. (All soil concentrations are reported in milligrams per kilogram and all aqueous concentrations are reported in milligrams per liter).

[3] The Threshold Limit Value (TLV), Time-Weighted Average (TWA) concentration limits published by the American Conference of Governmental Industrial Hygienists (ACGIH) or Occupational Safety and Health Administration Permissible Exposure Limit (PEL) to which workers may be exposed 8 hours per day, 40 hours per week, repeatedly without adverse health effects; the number listed is the more stringent of these two values.

[4] IDLH - Concentration of substance, as published by the National Institute for Occupational Safety and Health (NIOSH), which is immediately dangerous to life and health; a designation of Ca indicates that the compound is a known or suspected human carcinogen.

The potential site contaminants can have serious health consequences when an individual is overexposed. The site monitoring, to date, shows relatively low concentrations of these contaminants, which makes the overexposure probability relatively low. The concentrations of airborne, contaminants or contact hazards will be magnified considerably during intrusive (i.e., excavation) work, and it is possible that higher concentrations of contaminants or previously unidentified contaminants will be encountered. The primary issues for employee protection are the elimination of potential contact or respiratory exposures during excavation, movement, and replacement of potentially contaminated material. After potentially contaminated material has been excavated/processed, placed at its final destination, compacted, and covered with clean fill or an impermeable membrane, the potential for human exposure is very low and subsequently, Level D Protection will most likely be all that is required.

In addition to the likelihood of excavation exposing concentrated or previously unidentified contaminants, there is also an additional hazard when working in excavations and depressions. Because many of the organic vapors are heavier than air, and due to their emanating form the soil, higher airborne contaminant concentrations are likely to "pool" or concentrate in excavations or other low lying areas.

Again, employee protection during the construction phase of this work will reply on eliminating contact and airborne (respiratory) exposures during phases and areas of work where potentially contaminated soil is exposed, being excavated, or being transported. It will be possible to return areas of the site to unrestricted access once clean cover has been applied.

5.2 General Physical Hazards

Versar will be required by this HSP to develop an activity hazard analysis which will indicate the hazards associated with all phases of work activities on-site. This will be developed during the planning and mobilization stages of the construction. Figure 5-1 illustrates an example of a format that can be used for this analysis. This information will then be shared with task participants, and protective measures will be implemented at that time. The following is a list of the primary tasks and the types of hazards that Versar expects to encounter during the various phases of project execution.

Site Mobilization - including installation of utilities, trailers, decon trailer, bush-hogging the weeds, and placarding the site:

- Hazards associated with utility placement, including drilling, pole placement, avoiding buried obstacles, and electrical hazards;
- Proper placement of trailers, including preparing soil as necessary, blocking the trailer frame, and placing well anchored tie down straps. Also placement of stairs at the entry to each trailer;

Figure 5-1. Activity-Hazard Analysis

Activity: Analyzed by: Reviewed by:	Date: ______________ Date: ______________	
Principal Steps	**Potential Hazards**	**Recommended Controls**
Equipment to be Used	**Inspection Requirements**	**Training Requirements**

- Bush-hogging the weeds will require the knowledgeable and safe operation of this device, including keeping away from the blade. Additionally, proper eye, ear, foot and hand protection will be worn. The operator, and those assisting, also will stay vigilant for animals, snakes, and obstacles (rocks etc.); and

- Placarding the site and placement of any fences will require manual lifting as well as the use of power and hand tools. All electrical tools will be used with safe temporary power transmission, including assured grounding and/or GFCIs. Like all equipment, these tools will be used only by trained and experienced operators. Statistics show that most injuries from these types of activities are injuries to the hand. Employees will wear appropriate hand protection (i.e., gloves) throughout these activities.

Construction of the Treatment Building - Butler type prefabricated on-slab, installing skid mounted wastewater treatment system, piping, and instrumentation.

- Construction of these prefabs will create hazards of manual lifting, falling, having objects drop onto personnel, and the hazards associated with power and hand tools. Careful planning and preparation will be needed to maintain worker safety. Likewise, proper personal protective equipment, including head, eye, hand, and foot protection will be essential. All electrical tools will be used with safe temporary power transmission, including assured grounding and/or GFCIs;

- Installing the skid mounted wastewater treatment system will require the location and preparation of a suitable area and careful placement of these heavy objects. If a crane or other device is used, safety will rely primarily on the proper use of hand signals, placement, and tag lines. Additionally, personnel maintaining safe distances from these moving objects will be essential;

- Piping will require the use of power and hand tools as well as thermal devices and adhesives for joining pipe. Training, experience, and the proper use of personal protective gear (especially protective eye wear) will prevent tool related injuries. Likewise the proper use of stops and guards on power tools will ensure compliance. All electrical tools are to be used with safe temporary power transmission, including assured grounding and/or GFCIs. Any thermal work will require personal protection to prevent molten material from coming in contact with the person's body; and

- Installing instrumentation will primarily be limited to hazards associated with electrocution and using appropriate methods, tools, and personal protective gear to prevent that from occurring.

Trenching for SVE base system - will require the appropriate use of heavy equipment and some hand tool use. Excavation hazards and procedures are discussed below. In addition to the hazards associated with heavy equipment and personnel in excavations, there are the hazards associated with higher concentrations of potentially poisonous or flammable materials to increase in concentration during digging.

Concrete Pad Demolition and Crushing - will present hazards associated with dust (likely to contain silica) and projectiles generated during the forced break-up of concrete. Where possible, cutting and vibratory breaking will be used versus collision type techniques to break-up the concrete pads. Further crushing will be performed by machinery capable of containing any projectiles that may be generated. Likewise methods that may generate projectiles during breaking will be properly guarded (e.g., using barricades) to prevent flying objects from injuring personnel. Dust will be controlled to limit exposure and to maintain good visibility for the tool and/or equipment operators. Proper eye, face, and head protection will be worn by all employees involved in this operation.

Installation Of The Crushed Pad Materials In The SVE Trenches, Along With Dewatering Piping And Vacuum Piping - will require the careful interaction of equipment operators and their equipment with personnel on the ground. Careful communication using hand signals and radios will be required. Additionally some hand tool work and lifting will be necessary to move gravel; proper technique and personal protective gear (i.e. gloves) will be used to prevent injury. Personnel working near or entering excavations will comply with the excavation requirements outlined later in this document. Adhesives, and possibly some thermal techniques, will be used to join piping. The use of proper personal protective gear, such as glove and eye protection, will prevent injuries from both chemicals (solvents and flues) and molten metal. Most glues and adhesives used for joining plastic pipe are hazardous to human health. Prevention of contact with the skin (gloves and eye protection) and eliminating inhalation (use of respirators) may be necessary.

Installation of Liner over Base SVE Area - In addition to the hazards of tools and techniques used for cutting and joining these materials, there is most often occurrences of back strain. In some situations, laying a liner is very manual labor intensive, and if this is the case, extra awareness and training will be provided to workers prior to this activity commencing. Specific techniques of joining liner material will vary with the material and site conditions. The hazards associated with joining the specific liners to be used will be fully evaluated, and workers oriented prior to beginning this work activity.

Geotechnical Sampling - for sheet piling design will require the use of boring equipment. All drill rigs are intrinsically dangerous, and the equipment and operations surrounding this activity need to be reviewed prior to work and brought into compliance with the drilling section which can be found later in this HSP.

Installation Of Sheet Piling Followed By Excavation Of Contaminated Soils - will present the hazards of excavation discussed previously and in the section to follow. Installation of sheet piling, either vibratory or pole driven, presents specific equipment hazards which are dependent on the tools and technique employed. The most debilitating aspect of sheet pile installation is the noise that is generated. In some cases, both ear plugs and muffs are required to sufficiently protect one's hearing. Excavation of contaminated soils can generate significant airborne concentration of contaminants, expose contaminants previously not identified, and may generate an explosive environment. Continuous real-time air monitoring will be conducted throughout these activities to monitor the airborne health hazards and warn personnel in the event of a flammable vapor concentration.

Placement Of The Contaminated Soils On Top Of The Liner (Base SVE Systems) - In addition to the hazards of excavation previously mentioned (i.e., toxic and flammables atmospheres) and those issues covered later, there are those hazards associated with heavy equipment and personnel. Care will be taken to allow the efficient and safe transport and placement of the contaminated soil using signage, hand directions, radio communication, barricading, and traffic flow marking.

Backfill Excavation, Includes The Mining And Transport Of Borrow Materials - In addition to those hazards of personnel and equipment mentioned previously, care will be taken to safely mine, transport, and place fill. Equipment operators will be adequately trained and experienced. Additionally, operators and task planners will work together to "design in" stable and safe grades on which the heavy equipment can operate.

Installation of 2nd SVE System in the Excavated Soils on Top of the Liner - In addition to the hazards of the previous SVE installation, there may be more to deal with in terms of both the complexity of the system to be installed and the possible reduced compaction of the contaminated soil layer. Again careful planning and pre-training, as well as effective field oversight, will be utilized to prevent any potential problems from causing accidents or injuries.

Installation of a Soil Cap over the 2nd SVE System - In addition to the hazards described above associated with excavation, transport, and placement of fill, there is the covering of contaminated material with a positive barrier. This barrier, although permeable, should substantially reduce the airborne vapor concentrations, and thus lessen exposure (hopefully making downgrading to Level D possible) and eliminate the potential for explosive atmospheres.

O&M of SVE System, 2-Year Period - Day-to-day operations will most likely be carried out in Level D, but some maintenance activities may require the use of additional protective measures or equipment. These hazards will be better understood and backed up with air monitoring closer to the period when the operations and maintenance task will commence. Prior to this time, the hazards will be assessed, employees trained, and procedures and equipment supplied.

Miscellaneous Items

- Grouting the sump will be performed with the same basic protective measure used for excavating contaminated soil. In addition, the grouting equipment will be stably located and secured. Application will take place in Level C Protection with additional face shields;

- Closing wells will be performed in the same manner as grouting; and

- Minor excavations and trenching will be performed using the same protective measures as those used for excavation of contaminated soil.

5.2.1 Slipping and Tripping Hazards

As with any construction-type project, uneven work surfaces and other slip or trip hazards may be present. Proper site housekeeping and removal of trash and debris will be performed to reduce slipping and tripping hazards.

5.2.2 Contact With Energized Sources

During any site activities which involve work around live utilities, a potential exists for personnel, heavy equipment, or motor vehicles to come in contact with energized sources. Additionally, personnel could come in contact with energized parts of machinery or power tools. Contact with energized sources may result in fire, explosion, and/or electrocution. All work performed near electrical sources will be performed consistent with the OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449.

Control efforts for this hazard include requirements that all machinery and power tools used on-site be properly maintained, positioned, guarded, and operated by competent personnel. Equipment will not be permitted within a 20-foot radius of energized sources with nominal voltage less than 300 kV. For energy systems with nominal voltage greater than 300 kV, the distance required will be in accordance with OSHA regulations. The possibility of the presence of underground pipelines, electric wires, conduits, or vessels containing material under pressure will be investigated prior to the start of any subsurface work. Underground utility clearance will be obtained in conjunction with local authorities. The potential for contact with overhead utilities will be carefully assessed. Utility clearance will be documented in the SHSO or CS logbook.

5.2.3 Electrical Work

Site work involving electrical installation or energized equipment will be performed by a qualified licensed electrician. All electrical work will be performed in accordance with NEC 70 and OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449. Workers will not be permitted to work near electrical power circuits unless the worker is protected against electric shock by de-energizing and grounding the circuit followed by affixing appropriate lock-out/tag-out devices, or by guarding or barricading the circuit and providing proper personal protective equipment. All electrical installations will comply with the requirements of the NEC. All electrical wiring and equipment used will either be UL listed, or listed by a nationally recognized testing laboratory.

All electrical circuits and equipment will be grounded in accordance with the NEC and NESC regulations. The path to ground from circuits, equipment, and enclosures will be permanent and continuous. Ground fault circuit interrupters (GFCIs) are required on all 120-volt, single phase, 15- and 20-amp outlets on sites that are not part of the permanent wiring of a building or structure. A GFCI is also required when using an extension cord. GFCIs will be tested regularly with a GFCI tester.

Heavy duty extension cords will be used; flat-type extension cords will not be permitted. All extension cords will be the three-wire type, and designed for hard/extra hard usage. Electrical wire or cords passing through work areas will be protected from water and damage. Worn, frayed, or damaged cords and cables will not be used. Walkways and work spaces will be kept clear of cords and cables to prevent a tripping hazard. Extension cords and cables may not be secured with staples, hung from nails, or otherwise temporarily secured. Cords or cables passing through holes in covers, outlet boxes, etc. will be protected by bushings or fittings.

All switch boxes, circuit breakers, fuse cabinets, etc. will be clearly marked to indicate their purpose. Warning signs will be posted wherever energized electrical power circuits are exposed or concealed from view.

In existing installations, changes in the circuit protection (in order to increase the load in excess of the load rating of the circuit wiring) will not be allowed. All circuits will be protected against an overload.

Switches, circuit-breakers, fuse panels, and motor controllers will be contained in appropriately rated and listed enclosures, and installed so that water cannot enter or accumulate in wire ways or other electrical parts. Workers will be instructed in the safe procedures when working with energized equipment. Plugs and receptacles will be kept out of water (unless they are approved for submersion).

All lamps used in temporary lighting will be protected from accidental contact and breakage. Metal shell and paper-lined lamp holders will not be permitted. Fixtures, lamp holders, lamps, receptacles, etc. are not permitted to have live parts.

5.2.4 Lock-Out of Circuits and Equipment

Before a worker sets up, services, or repairs a system or motor-driven equipment where unexpected energizing (or release of stored energy) could occur and cause injury or electrocution, the circuits energizing the parts will be locked-out and tagged. Only authorized personnel will perform lock-out/tag-out procedures. All workers affected by the lock-out/tag-out will be notified prior to, and upon completion of, the lock-out/tag-out procedure.

Training on lock-out/tag-out procedures will be provided to all involved workers. Training will include information on the recognition of hazardous energy sources, the purpose and use of energy control procedures, proper lock-out/tag-out procedures, and prohibitions against re-starting or re-energizing a system which has been locked-out and tagged-out. Training will be documented by the SHSO.

Lock-out/tag-out devices will be capable of withstanding the environment to which they are exposed. Locks will be attached in such a way as to prevent other personnel from operating the equipment, circuit, or control, or from removing the lock, unless they resort to excessive force. Tags will identify the worker who attached the device, and contain information which warns against the hazardous condition that will result from the system's unauthorized start-up. Tags will be legible and understood by all affected workers and incidental personnel.

The procedures for attaching and removing lock-out/tag-out devices include the following steps:

- Disconnect the circuits and/or equipment to be worked on from all electrical energy sources. Ensure that the system is completely isolated so that it cannot be operated at that shut-off point or at any other location;
- Release stored electrical energy;
- Block or relieve stored non-electrical energy;
- Place a lock on each shut-off or disconnect point necessary to isolate all potential energy sources. Place the lock in such a manner that it will maintain the shut-off/disconnect in the off position;
- Place a tag on each shut-off or disconnect point. The tag will contain a statement prohibiting the unauthorized re-start or re-connect of the energy source and the removal of the tag, and the identity of the individual performing the tag and lock-out;
- <u>Each</u> worker who will be working on the system will place their own lock and tag on <u>each</u> lock-out point;

- A qualified person will verify that the system cannot be re-started or re-connected and that de-energization of the system has been accomplished;

- A qualified person will conduct an inspection of the work area to verify that all tools, jumpers, shorts, grounds, etc. have been removed so that the system can then be safely re-energized;

- All workers will stand clear of the system; and

- Each lock and tag will be removed by the worker who attached it. If the worker has left the site, then the lock and tag may be removed by a qualified person under the following circumstances:

  - The qualified person ensures the worker who placed the lock and tag has left the site.
  - The qualified person ensures the worker is aware the lock and tag has been removed before the worker resumes work on-site.

5.2.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, or generators. High noise operations will be evaluated by the SHSO. Employees with an exposure exceeding 85 dBA (a scale, slow response) will be required to wear hearing protection. As a general practice, hearing protection will be worn when operating heavy equipment and power tools. If employees are exposed above 85 dBA, the Versar will implement its corporate hearing conservation program.

5.2.6 Manual Lifting

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries, such as pulls and disc impairments, can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back. Proper manual lifting techniques include the following steps:

- Plan the lift before lifting the load. Take into consideration the weight, size, and shape of the load. Preview the intended path of travel and the destination to ensure there are no tripping hazards along the path;

- Hands and fingers will be protected from rough edges, sharp corners, and metal straps by using heavy work gloves. Also, keep hands away from potential pinch points between the load and other objects;

- If the load is too heavy, then do not lift it alone. Lifting is always easier when performed with another person. Assistance should always be used when it is available;

- Keep your back straight and do not bend your back too far, instead, bend at your knees;

- Feel the weight, and test it; and

- When you begin to lift, do so smoothly, and let your legs do the lifting. If you must pivot, do not swing just the load, instead, move your feet and body with the load.

5.2.7 Weather-Related Hazards

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, or limited visibility. These hazards correlate with the season in which site activities occur. Outside work will be suspended during electrical storms. In the event of other adverse weather conditions, the SHSO will determine if work can continue without endangering the health and safety of site personnel.

5.2.8 Heat/Cold Stress

Heat stress is a significant potential hazard during the warmer months. Heat stress manifests itself as one of three conditions: heat cramps, heat exhaustion, or heat stroke. Heat cramps are brought about by a prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, triggering painful muscle cramps. The signs and symptoms of heat cramps include:

- Severe muscle cramps, usually in the legs and abdomen;

- Exhaustion, often to the point of collapse; and

- Dizziness or periods of faintness.

First aid treatment includes shade, rest, and fluid replacement. The individual will drink electrolyte-replacement fluids (e.g., Gatorade, Squincher, 10-K), which will be made available to field personnel. If the individual has not recovered within ½ hour, then he/she will be transported to the hospital for medical attention.

Heat exhaustion usually occurs in a healthy individual who has been exposed to excessive heat while working or exercising. Blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion include:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin, with heavy perspiration;
- Skin appears pale;
- Fatigue, weakness, and/or dizziness; and
- Elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual has not recovered within ½ hour, he/she will be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat, and their body systems become overwhelmed by heat and begin to stop functioning. This condition is a medical emergency, requiring the immediate cooling of the victim and transport to the hospital immediately.

The signs and symptoms of heat stroke include:

- Victim has stopped sweating;
- Dry, hot, red skin;
- Body temperature approaching or above 105°F;
- Dilated (large) pupils; and
- Loss of consciousness; victim may lapse into a coma.

Local weather conditions may produce an environment which will require restricted work schedules in order to protect employees. The SHSO will be observing workers for any potential symptoms of heat stress. Adaptation of work schedules and training on recognition of heat stress conditions will help prevent heat-related illnesses from occurring.

Cold stress is a danger at low temperatures and when the wind chill factor is low. Cold stress is generally described as a local cooling (frost nip, frost bite, and freezing) or a general cooling (hypothermia). Personnel working outdoors in temperatures at or below freezing may be subject to local cooling. Areas of the body that have a high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. The three categories of local cooling include:

- Frost nip - characterized by a blanching or whitening of the skin;
- Frost bite - skin has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient; and
- Freezing - skin tissue is cold, pale, and solid.

Frost nip and frost bite first aid includes covering the affected area with warmth and retreating to a warm area. Frozen tissue is a medical emergency, and the victim will be transported to the hospital immediately.

General cooling (hypothermia) occurs when exposure to cold reduces body temperature. With prolonged exposure, the body becomes unable to maintain its proper internal temperature. Without treatment, hypothermia will lead to stupor, collapse, and death.

The signs and symptoms of mild hypothermia include:

- Shivering;
- Numbness; and
- Drowsiness.

First aid for mild hypothermia includes using heat to raise the individual's body temperature. Heat may be applied to the victim in the form of heat packs, hot water bottles, and blankets.

The signs and symptoms of severe hypothermia include:

- Unconsciousness;
- Slowed respiration or respiratory arrest;
- Slowed pulse or cardiac arrest;
- Irrational or stuporous state; and
- Muscular rigidity.

First aid for severe hypothermia includes handling the victim very gently; rough handling may set off an irregular heart beat. Do not attempt to re-warm the severely hypothermic victim; re-warming may cause the development of an irregular heart beat. Severe hypothermia is a medical emergency, and the victim will be transported to the hospital immediately.

Prevention of cold stress is a function of whole body protection. Adequate insulated clothing will be worn when the air temperature drops below 40°F. Reduced work periods may be necessary in extreme conditions to allow adequate periods in a warm area.

5.2.9 Welding, Cutting, and Hot Work

Hot work will be performed in accordance with 29 CFR 1926.350 through 1926.354. Hot work includes oxygen-acetylene welding and cutting, arc welding and cutting, gas metal welding, propane torches, and grinding.

A Hot Work Permit will be completed by the SHSO and co-signed by the CS prior to the start of the task. A copy of the Hot Work Permit is included in Appendix C. The SHSO will conduct a safety briefing on hot work rules and procedures, and all hot work participants will sign the permit. The permit will be posted at the location of the hot work. The SHSO will also conduct a visual inspection of the area for flammable and combustible materials before hot work begins. Hot work will not be performed if there is a possibility of an explosive atmosphere or an oxygen-enriched atmosphere. If combustible material is found in the area, then the hot work crew will either move the intended hot work away from the combustible material, move the combustible material away from the intended hot work, or shield the combustible material from the hot work. The SHSO will designate a fire watch to monitor the hot work. The fire watcher will have access to a properly rated fire extinguisher and will remain on-duty for ½ hour after the hot work is complete.

All hot work equipment will be inspected daily, prior to use. If the equipment is found to be defective, it will be removed from service and tagged with a "Do Not Use" sign. Hoses and connections will be rated for the operating requirements of the system and will be tested regularly. Damaged or worn hoses, torches, and connections, etc. will not be used. All welding and cutting personnel will be trained in the safe operation of their equipment.

Hot work personnel and nearby workers will be shielded from welding rays, flashes, sparks, molten metal, and slag. When performing hot work on items that have a toxic coating (e.g., lead-, chromium-, nickel-based paint), workers will use proper respiratory protection, and a respiratory protection program will be implemented. Other hot work PPE may include: a welding helmet, cutting goggles, leather gauntlet gloves, and a long-sleeved leather jacket.

Cable, hoses, and other hot work equipment will be kept out of passageways, aisles, and stairways. Workers will be able to easily distinguish between the fuel gas hose and the oxygen hose. Slightly damaged cables will be repaired as long as the repair is not within 10 feet of the welding machine. Cable will be unrolled before hot work begins.

Oxygen cylinders, manifolds, and regulators will be completely free from oil, grease, and other flammable substances. Interchanging regulators, manifolds, and hoses with any other compressed gas is prohibited. Manifolds, hoses, and regulators will be stored in ventilated boxes. All compressed gas valves will be opened slowly. Torch valves will be closed, and the gas supply will be turned off when hot work is suspended. When not in use, the cylinder manifold and header hose connections will be capped. Compressed gas cylinder valves will be closed and valve caps will be put on when they are in storage, in transit, or empty. Valve protection caps will be put on when the regulator is taken off. Before the regulator is removed, the compressed gas cylinder valve will always be closed, and the gas will be released from the regulator.

Compressed gas cylinders will be stored outside in a well-ventilated location. Empty cylinders will be segregated from full ones, and oxygen cylinders will be stored at least 20 feet away from fuel gas cylinders. All compressed gas cylinders will be stored at least 40 feet away from flammable and combustible material. Smoking is prohibited where compressed gas cylinders are stored, handled, or used. Fuel gases will be kept away from open flames, hot metal, electrodes, electrical circuits, and any other sources of heat. Cylinders will be stored in an upright position and secured. They will not be intentionally dropped, struck, or permitted to strike each other. Cylinder valve protection caps will not be used for lifting cylinders from one position to another. Compressed gas cylinders will not be permitted to be taken into confined spaces. No one except the gas supplier will refill gas cylinders or mix different gases in a cylinder.

Hot work torches will only be lit by friction lighters. Workers will not use or carry matches or lighters while performing hot work due to the danger of hot work sparks or molten metal "splattering" onto the matches or lighter and causing a fire or explosion. Manifolds will have the name of the substance written on them (at least 1 inch in height). All manifolded systems will contain back-flash arresters. Acetylene regulators will not be adjusted greater than 15 psi (for easier shut off in a fire emergency). No items, which will damage the manifold or interfere with quick closing of its the valves, will be put on top of the cylinder manifold when it is in use.

Hot work performed on this project is not expected to include arc welding or gas metal welding. However, OSHA welding standards will be followed if these additional types of welding become necessary.

5.2.10 Excavation and Trenching

All excavations will be performed in accordance with 29 CFR 1926 Subpart P. Excavations are defined to include trenching. Prior to starting any excavation, the possibility of the presence of underground pipelines, electric wires, conduits, or vessels containing material under pressure will be investigated. Underground utility clearance will be obtained in conjunction with authorities from local utilities and may be supplemented with an on-site magnetometer sweep. Utility clearance will be documented in the SHSO or CS's logbook. All surface encumbrances that will create a hazard to workers will be removed or supported.

Excavations, adjacent areas, and protective systems will be inspected by the CS on the following schedule:

- Daily, prior to work commencing in or around the excavation;
- After every rain storm or other hazard-increasing occurrence; and
- As needed throughout the work shift as conditions change.

If the CS notes a hazardous condition, all endangered workers will be immediately removed from the hazard, and all work in the excavation stopped until the necessary corrections have been made. The CS has extensive experience with excavation work, and has the authority to direct all excavation activities and to issue a stop work order if hazardous conditions are encountered. The CS is also responsible for coordinating with the PM, CM, and the Engineer to resolve any excavation complications.

The following safety controls will be implemented for all excavation activities:

- Excavations that may contain toxic or oxygen-deficient atmospheres will be monitored by the SHSO prior to the start of each shift and at periodic intervals during the shift. Results of air monitoring will be documented in the SHSO's logbook. Additional safeguards may be necessary when excavating areas that may contain a hazardous atmosphere. OSHA excavation standards will be followed if a hazardous atmosphere is suspected;
- The sides of all excavations in which workers may be exposed to danger from shifting soil will be guarded by a protective system. The requirements specified in Appendices B and C of 29 CFR 1926 Subpart P will be followed in these circumstances. These appendices provide information on proper sloping, shoring, and benching protective systems. Excavations less than 5 feet, which do not have a potential for a cave-in, will not require a protective system;
- If the stability of adjacent structures is endangered by the excavation, then support systems, such as shoring, bracing, or underpinning, will be provided;
- Personnel will not work in excavations in which there is accumulated water, or water is accumulating, unless adequate precautions have been taken to protect workers against the hazards caused by water accumulation;
- Workers will be protected from loose rock or soil which could fall from an excavation face;
- Excavated soil will be placed at least 2 feet from the edge of the excavation;

- When mobile equipment is operated near an excavation, or required to approach the edge of an excavation, a warning system (e.g., barricades, hand signals, mechanical signals, stop logs) will be used;

- A stairway, ladder, ramp, or other safe means of exit will be located in trench excavations that are greater than 4 feet in depth. The means of exit will require no more than 25 feet of lateral travel for each person in the excavation; and

- Workers will not be permitted underneath loads handled by lifting or excavating equipment.

5.2.11 Drilling

All drilling will be performed in accordance with 29 CFR 1926 and applicable local regulations.

The following safety controls will be implemented during all soil drilling activities:

- Drill rigs will be equipped with an operational emergency stop device. Drillers and helpers will be aware of the location of the device. The device will be tested prior to initial drilling, and periodically thereafter;

- The driller will never leave the controls while tools are rotating unless all personnel are prevented from working near the rig and the driller remains in close visual contact with the rig;

- A long-handled shovel or equivalent will be used to clear drill cuttings away from the boring and rotating tools. Hands and/or feet will not be used for this purpose;

- If personnel must work near any tools which could rotate, the driller will shut down the rig prior to initiating such work;

- Only equipment which has been approved by the manufacturer will be used in conjunction with sections of drilling tools. Pins that protrude from augers will not be allowed;

- Drillers, helpers, samplers, etc. will secure all loose clothing when working in the vicinity of drilling operations;

- No personnel will climb the drill mast unless fall prevention measures have been installed;

- Hands or fingers will never be placed under the bottom of an auger while it is being positioned. The tool hoist will always be used to lift and position augers; and

- Cathead and rope will be inspected for integrity prior to initial drilling operations. The cathead and rope will be clean, dry, and unworn. As few wraps as needed will be used. The length of rope being used will be minimized, and the rope will never be wrapped around hands, arms, or legs. Personnel will stand clear while materials are being hoisted, as the cathead could grab the rope and cause the material to rise quickly to the top of the mast, causing the rope to break and the material to fall.

5.2.12 Heavy Equipment Operation

Heavy equipment will only be operated by qualified and licensed personnel. Equipment will not be operated in a manner that will endanger persons or property. All heavy equipment will be operated in accordance with the manufacturer's instructions and 29 CFR 1926 Subpart O. The following controls will also be implemented during this project:

- Equipment will be inspected by the operator on a daily basis, prior to starting work. Records of tests and inspections will be maintained on-site by the contractor (a copy of the heavy equipment inspection log is included in Appendix C);

- Any unsafe equipment will be removed from service until safety defects can be corrected. Defective equipment will be tagged with a "Do Not Operate" sign;

- Equipment will be shut down and locked out before maintenance or repairs are made;

- Operators will be trained and experienced in the use of their equipment;

- Equipment will be properly guarded;

- Signals will be given to the operators of equipment in any work area by one designated person;

- All personnel will stay clear of the operational area of the equipment. Workers will not be permitted to stand directly underneath any load or piece of equipment (e.g., manlift, backhoe bucket, crane load, etc.);

- Operators will not leave their equipment unattended while it is running;

- All mobile equipment will have an audible backup alarm and an audible warning device (i.e., a horn);

- Equipment will not be operated in a careless or unsafe manner;

- Each piece of equipment will have a portable fire extinguisher rated not less than 10-B:C;

- Personnel will wear appropriate PPE when working with heavy equipment. Dermal protection will fit properly and be taped to prevent "caught on" or "caught between" hazards;

- Heavy equipment will be shut down during refueling operations;

- Work areas will be adequately illuminated;

- Whenever equipment is parked, the parking brake will be set. If the equipment is parked on an incline, in addition to setting the parking brake, the wheels will also be chocked;

- Workers are prohibited from riding in equipment buckets and booms; and

- Whenever equipment is in use near excavation, the machine will be positioned no closer than necessary to the excavation and the location will be assessed to ensure there is no danger of cave-in.

5.2.13 Flammable and Combustible Liquids

Storage of flammable/combustible liquids will not exceed 1,100 gallons in any one area. All flammable and combustible liquids will be stored outdoors, in a well-ventilated area, and away from excessive heat or direct sunlight. These liquids will not be stored in areas used for exits, stairways, or aisles. Material which reacts with water will not be stored near flammable or combustible liquids. All sources of ignition are prohibited in this area, including: smoking, cutting and welding, hot surfaces, open flames, sparks (static, electrical, and mechanical), and frictional heat. "Flammable Liquids" and "No Smoking or Open Flames" signs will be posted in the storage area. At least one portable fire extinguisher rated not less than 20-B:C will be located within 10 feet of the entrance to the storage area, and at least one similar fire extinguisher will be located between 25 and 75 feet outside the storage area.

Each fueling area will have at least one portable fire extinguisher rated not less than 20-B:C within 75 feet of each pump and dispenser. Smoking and open flames will be prohibited in fueling areas. Motors will be turned off before equipment is refueled. At least one portable fire extinguisher rated 20-B:C will be located on all vehicles transporting or dispensing flammable or combustible liquids.

Flammable and combustible liquids will be handled only in areas that have adequate ventilation. Workers will not be permitted to use liquids having a flash point less than 100°F as a cleaning/degreasing fluid. Workers should change as soon as possible if flammable or combustible liquid is spilled on their clothing.

Spills in dispensing areas will be controlled by using drainage, diking, or absorbent material. Flammable liquids will only be transferred when the two containers are electrically interconnected (i.e., bonded). When dispensing flammable and combustible liquids into smaller portable containers, only approved safety containers equipped with back-flash arresters will be used.

Handling, storage, and use of flammable and combustible liquids will be in compliance with 29 CFR 1926.152 and all applicable sections of the NFPA National Fire Code.

5.3 Biological Hazards

Numerous types of pest organisms may be present, depending on the time of year, including mosquitos, snakes, and ticks. Field personnel are encouraged to use insect repellents when mosquitos and ticks are present. To avoid snake bites, personnel will check the ground for snakes before walking through grassy or debris strewn areas. A first-aid kit and insect repellent will be available for use in the field. In many parts of the United States, tick-borne diseases pose a significant health risk during warm months. Personnel are advised to check themselves periodically throughout the day, and thoroughly as they shower at the end of the day. Any snake or tick bites will be reported to the SHSO.

5.4 Radiological Hazards

Reports indicate that during the early 1970s, approximately 20,000 pounds of waste was shipped to the ECC Site from facilities under control of the Department of Energy which may have contained low level radiation not exceeding 0.001 millicurie. It is expected, however, that all of the waste was removed during the initial Phase I emergency clean-up, and that none remains on-site. During a site investigation of surface debris in November 1992 by AWD, no indications of radiation were detected. For this reason, no encounters with radioactive material are expected during site preparation and material removal activities.

6.0 SITE CONTROL MEASURES

6.1 Work Zones

6.1.1 Exclusion Zone

The exclusion zone (EZ) is designated as all areas within the remedial boundary as shown on Radian International's Contract Drawing Number G-2, Site General Arrangement and Safety Plan (see Figure 6-1). Versar will establish either physical barriers and/or administrative controls to regulate the entrance and exit of personnel and equipment from this area. No unauthorized personnel will be allowed access to the exclusion zone. The Site Security Plan details procedures regarding Site access and is included in within the Construction Site Management Plan.

All personnel entering the exclusion zone will do so from the Main Contaminant Reduction Zone (CRZ) detailed on Figure 6-1. Personnel entering the EZ will don the appropriate personnel protective equipment as specified by the SHSO and will exit through the CRZ following the prescribed decontamination procedures (see Section 9.0 of this HSP) under the observation of the SHSO.

6.1.2 Contamination Reduction Zone

A CRZ will be established at each exit from the exclusion zone. The CRZ will be designed to accommodate either personnel and/or equipment exiting the EZ, depending on its use. The main CRZ will be the existing concrete decontamination pad as shown on Figure 6-1. This CRZ will be the primary location for the decontamination of heavy equipment and vehicles that have entered the EZ.

6.1.3 Support Zone

The Support Zone (SZ) is defined as all areas within the support zone security fence that are not within a CRZ or EZ. No personnel or equipment will be permitted to enter the support zone from the EZ without going through the appropriate decontamination. All site trailers (i.e. office, storage, etc.) will be located in the support zone. Placement of site trailers in the Support Zone is shown on Figure 6-1.

During remedial activities, Versar will ensure that any areas designated as an SZ remains free of potential contamination (i.e., no potential exposure to workers and/or the public via soil, water, or air emissions from the EZ). If a designated SZ area becomes an area of exposure potential, Versar will reconfigure the site layout and/or modify operations to ensure appropriate exposure controls are maintained. Details for decision making criteria and monitoring for the SZ configuration are presented in the Air Monitoring Plan and are not addressed herein.

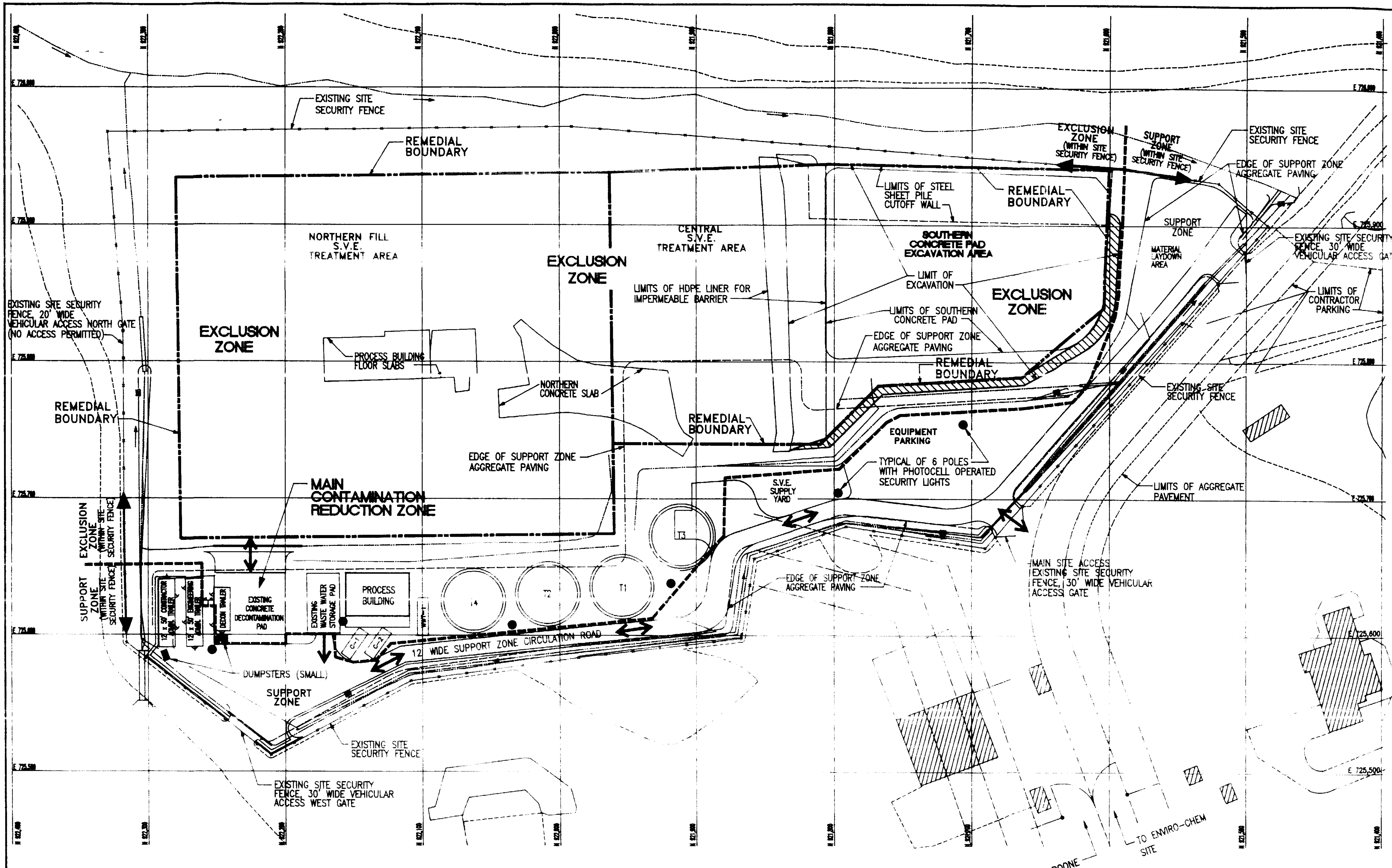


FIGURE 6-1

SITE GENERAL ARRANGEMENT AND SAFETY PLAN

The three-zone approach assumes that an appreciable exposure scenario exists. In situations involving negligible exposure potentials (i.e., surface activities), site zoning procedures may be modified following approval of the SHSO. In all instances, applicable information will be appropriately communicated to all personnel.

No employees will be permitted to enter any exclusion zone or any other area where there is a potential for chemical exposure unless they have the appropriate medical clearance, training, and PPE. Keeping current medical and training documentation on-site will enable the CS and SHSO to ensure that unauthorized personnel do not enter a restricted work area. The CS will be responsible for identifying and controlling the personnel and equipment in their respective work area. This will be accomplished via daily logbook entries. Additionally, all personnel passing through the decontamination area of the site will sign a daily tracking sheet indicating their entrance into the controlled area. All exclusion zone work will require that the buddy system be used.

6.2 Markings/Signs

The following markings/signs will be used as visual indicators:

- Exclusion Zone Marking
    - The outer limits of the EZ will be marked by signs or barricades. Each sign and/or barricade will read "Exclusion Zone - Proper PPE Required". All signs and/or barricades will be constructed in conformance with 29 CFR 1910.145.

6.3 Communications

On-site communications will consist of two-way radios operating on a single frequency that will be carried by the CS, SHSO, and the team leader or foreman of each work crew. A "base station" will be monitored by personnel in the support trailer in the event that an outside emergency agency needs to be notified immediately by telephone.

Emergency telephone numbers and reporting instructions for ambulance, hospital, fire, and police will be available at the site. All field personnel will be briefed concerning the people and equipment to be contacted during an emergency.

An internal communication system consisting of hand signals, as well as voice communication, will be adopted by field personnel because of potentially noisy working conditions at the Site. The hand signals suggested to be used during field operations are:

- Hand gripping throat - out of air, can't breathe;
- Grip partner's wrist - leave area immediately;

- Hands on top of head - needs assistance;

- Thumbs up - OK, I am alright, I understand; and

- Thumbs down - no, negative.

6.4 Security

Security procedures will be under the direction of the CS. The support zone will be established within a fenced-in area. No entry into the support zone by unauthorized personnel will be permitted. All access gates into the support zone will be either locked and/or monitored to ensure only authorized personnel are permitted access. All gates to the support zone will be locked at the end of the work day. No further security measures are anticipated.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 General

As required by OSHA standards, Versar will use engineering and administrative controls as the primary means of exposure control. However, personal protective equipment (PPE) may also be necessary to further minimize potential employee exposure. Versar will NOT provide PPE for non-Versar/Handex employees or visitors to the site. Decision-making criteria for utilizing PPE will include:

- Historical information;
- Known/suspected contamination;
- Work location/duration;
- Task being performed/method of operation;
- OSHA requirements; and
- Other requirements as directed by applicable regulations.

Throughout the course of activities, PPE requirements may need to be modified (upgraded or downgraded) due to environmental concerns/site conditions (i.e., dusty conditions, visual contamination, exceeding monitoring instrument action levels) and/or if additional analytical data becomes available which suggests an increased or decreased level of hazard. All modifications will be directed by the SHSO with approval from the HSO.

OSHA requirements (29 CFR 1910.120) dictate that when PPE is used, a PPE program be developed. Similarly, separate requirements are dictated by OSHA for respiratory protection. However, it is realized that there is much overlap between PPE and respiratory protection, since respiratory protection is in fact a facet of PPE. Versar's corporate PPE and respiratory protection programs are attached as Appendix A.

7.2 General Levels of Protection

The levels of protection utilized during the remedial action will vary depending upon the means and methods selected by the Versar. The levels specified in this HSP will be considered guidelines.

7.2.1 Respiratory Protection

The primary respiratory protection expected to be used are full-faced air purifying respirators equipped with combination organic vapor/HEPA cartridges for removing organic vapors, dusts, mists, and fumes. Versar's respiratory protection program (see Appendix A) follows the OSHA guidelines in 29 CFR 1910.134. The guidelines to be followed when using Level C respiratory protection include:

- Air purifying cartridges will be replaced at the end of each shift, or more frequently, as needed;
- Only employees who have had a pre-issue qualitative fit test will be allowed to work under Level C respiratory protection;
- Employees will have been instructed and trained in the proper use of respirators and their limitations;
- Only employees who have passed a medical examination, including a pulmonary function test, will be allowed to use Level C respiratory protection;
- Conditions that prohibit a proper seal between the respirator and face (e.g., facial hair, eyeglasses with earpieces, etc.) will not be allowed. The wearer will check the facepiece fit every time he or she puts on the respirator;
- Respirators will be regularly cleaned and disinfected;
- Respirators used routinely will be inspected during cleaning and worn or deteriorated parts will be replaced; and
- Respirators will be stored in a convenient, clean, and sanitary location.

7.2.2 Summary of PPE Required per Task

Table 7-1 illustrates the minimum level of PPE that will be used for each activity identified in this HSP. Table 7-2 provides a description of the individual items required for each level of protection. Section 8.3 of this HSP provides the decision logic (i.e., Action Levels) for upgrading and/or downgrading the initial level of protection.

TABLE 7-1. Initial and Potential PPE Levels for Each Site Activity

Task	Initial Levels of Protection	Potential Levels of Protection
Mobilization	D	D
Setup of Equipment	D	Modified D
Earth Handling Activities/Trenches Inside Remedial Boundary	C	Modified D, C, B
Buried Pipe Construction/Installation	C	Modified D, C, B
Soil Drilling	C	Modified D, C, B
SVE Construction (Above ground)	D	Modified D, C
SVE Operations/Maintenance	D	Modified D, C
Cap Installation	D	Modified D, C
Decontamination	C	Modified D, C
Demobilization	D	D

Table 7-2. Description of Personal Protective Equipment by PPE Level

PPE Required	Levels of Protection				
	D	Modified D	C	Modified C	B
Cotton Coveralls	X	X	X	X	X
Eye Protection Meeting ANSI Z87.1	X	X			
Hard Hat	X	X	X	X	X
Steel Toe Boots	X	X	X	X	X
Tyvek/PE Coveralls		X			
Saranex or Other Acceptable Laminate Coveralls			X	X	X
Rubber Boots/Boot Covers		X	X	X	X
Inner Surgical Gloves (Latex/Nitrile)		X	X	X	X
Outer Nitrile Gloves		X	X	X	X
Full Face Respirator w/GMC-H* Cartridges			X	X	
Self-Contained Breathing Apparatus					X
Duct Tape All Joints		X	X	X	X
As Needed					
Leather or Cotton Work Gloves	X	X	X	X	X
Hearing Protection	X	X	X	X	X

Notes
* Combination organic vapor/HEPA cartridges

8.0 AIR MONITORING/SAMPLING REQUIREMENTS

8.1 Perimeter

Perimeter air monitoring/sampling will be conducted in accordance with the project Air Monitoring Plan and is not addressed herein.

8.2 Industrial Hygiene Sampling

Eight-hour TWA samples, which are representative of the level of exposure of personnel involved in on-site work activities where personnel may be exposed to hazardous levels of airborne chemicals, will be collected and analyzed. Samples will be collected from the breathing air space of the employee within a 1-foot radius of the head. Personal monitoring pumps will be attached to workers who have the highest expected exposure. Two "maximum risk employees" will be selected for each operation to determine the maximum exposure limits. Maximum risk employees are defined as those on-site workers who are performing tasks closest to the expected or suspected source(s) of potential contamination. Additional personnel sampling of other employees will be performed if the "maximum risk employee(s)" of an operation are found to be working at or above one-half of an established OSHA Permissible Exposure Limit.

Personnel TWA sampling will be done in accordance with acceptable NIOSH methods and analysis conducted by an AIHA accredited laboratory.

The principal constituents to be monitored are particulate matter and volatile organics. Although semi-volatiles such as phthalates, phenols, polynuclear aromatic hydrocarbons, and PCBs were detected at the site, only phthalates were found frequently and at higher concentrations during the remedial investigation. Phthalates are particulate adsorbed constituents. Consequently, the risk associated with phthalates will be minimized through the control of PM-10 fugitive emissions. Therefore, sampling and analysis of semi-volatiles will not be performed.

Several VOCs were detected during the remedial investigation, however, the target constituents to be monitored are:

- Methyl chloroform;
- Perchloroethylene;
- Trichloroethylene;
- Ethylbenzene;
- Toluene;
- Methylene chloride; and
- Xylenes.

This selection was made based on the occurrence and potency of these constituents. Of the seven constituents in soil, trichloroethylene concentrations were the highest, and its contribution to the excess cancer risk was the dominant one.

Personnel TWA sampling initially will be done on a daily basis for three days during active work in the Northern, Central, and Southern areas of the site. Following this initial period, sampling will be conducted not less than once per work week during intrusive activities when potential exposure is expected to be the greatest. However, if the data generated during the initial sampling indicates that exposures are not significant, the SHSO in conjunction with the HSO may terminate the integrative sampling and document exposures through the use of real-time instruments. Results will be available within 48 hours of sampling, or the next scheduled work day.

In addition to quantitative sampling, there will also be frequently collected qualitative samples to determine the contaminants to which workers may be exposed. These samples will be collected for organic vapor, metals, and mineral silica analyses. This will assure that TWA and real-time sampling are being performed for the most significant air-borne hazards.

8.3 Real-Time Ambient Air Monitoring

Organic vapors and lower explosive limit/oxygen percentage will be monitored throughout the project. The primary purpose of this monitoring is to provide immediate feedback to the SHSO regarding potential exposures during intrusive activities, so that actions can be taken, if necessary, to reduce vapor releases in the work area. Monitoring data will be collected for these parameters throughout all intrusive site activities, initially on an hourly basis. This frequency may be adjusted based on site conditions and the professional judgement of the SHSO. However, at a minimum, real-time readings will be taken at the beginning of every work shift and when site conditions change.

Real-time monitoring will include the following equipment. VOCs will be monitored using a photoionization detector (PID) with an 11.7 eV lamp. Lower explosive limits (LEL) and oxygen concentrations will be monitored using an LEL/O_2 meter. The LEL/O_2 meter will be used to detect oxygen-deficient, oxygen-enriched, and combustible atmospheres. Particulates will be monitored using a mini-ram or its performance equivalent. The mini-ram will be used to document respirable dust exposure during concrete crushing operations and/or during material handling activities where visible emissions are occurring.

All monitoring instruments will be calibrated daily in accordance with the manufacturer's recommendations.

All real-time perimeter air monitoring will be conducted according to the project air monitoring/sampling plan.

Colorimetric detector tubes will be kept on-site by the SHSO. Tubes will be available for the chemicals of concern for the site. They will be utilized upon an indication of a PID reading of 5 ppm for the purpose of qualitatively determining which chemical potential exposure exists, and to determine what type of respiratory protection is appropriate.

A daily log will be kept at the site to record all monitoring data. The data will be summarized as part of a daily report, including parameter, instrument type, air concentration measured, time, and location.

Table 8-1 provides the action levels to be utilized for this project.

Table 8-1. Monitoring Instrument Action Levels

	Air Quality Measurement	Response
Exclusion Zone Action Level - Volatiles		
PID	0 - 5 ppm above background in breathing zone	Level D
PID	5 - 10 ppm above background in breathing zone	Level C
PID	Above 10 ppm above background in breathing zone	Level B
Action Level - Combustible Atmosphere		
CGI	Less than 5 percent LEL knowns	Continuous monitoring
CGI	Greater than 5 percent LEL or unknowns	Stop work and locate source
CGI	Greater than 10 percent LEL knowns or unknowns	Stop work and evacuate area
Action Level - Colorimetric Detector Tubes		
Specific Contaminant	1/2 Applicable Exposure Limit (e.g., benzene)	Level C
Specific Contaminant	Greater than 10 times Applicable Exposure Limit	Stop work; consult SHSO
Action Level - Mini-Ram		
Mini-Ram	0 - 1 mg/m^3 above background	Level D
Mini-Ram	1 - 5 mg/m^3 above background	Level C
Mini-Ram	>5 mg/m^3 above background	Level C - initiate dust suppression.; notify HSO

9.0 DECONTAMINATION PROCEDURES

Decontamination of equipment and personnel will be performed to extend the useful life of safety equipment, to prevent cross-contamination of samples, and to prevent worker exposure to hazardous substances. All decontamination activities will be carried out within the CRZ, and any residuals generated (i.e., decontamination water, disposable gloves, disposable suits, etc.) will be placed in secure containers for disposal in accordance with local, state, and federal regulations.

9.1 Equipment Decontamination

9.1.1 Decontamination Pad

A decontamination pad has been constructed as a washdown area for all materials, equipment, and vehicles used in the EZ or CRZ. The equipment/vehicles will be placed (driven) onto the decontamination pad and the proper wash/rinse procedures will be followed. All waters will drain to a collection sump and will be transferred to the on-site wastewater storage tanks. The sides of the decontamination pad will be enclosed with plastic sheeting, if necessary, to control the spray from the pressure washer and hoses.

The equipment/vehicles will be held for a short period of time to allow for the drippings to be retained in the collection basin. Equipment will then be permitted to be removed from the CRZ to a clean area.

All equipment/material decontamination activities will require the use of poly-coated Tyvek or its performance equivalent for the purpose of splash protection. In addition, splash shields will be utilized during decontamination procedures.

Decontamination of personnel and equipment will be monitored by the SHSO for effectiveness at the beginning of the project and periodically throughout its duration. The effectiveness of decontamination will be monitored through visual observations, wipe sampling (i.e., for equipment decontamination), and cleaning solution analysis. Visual observations will include noting discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric or equipment surfaces. Wipe sampling will be conducted for equipment, and will include wiping the surface with a wet cloth (e.g., a gauze pad) or swab followed by laboratory analysis of the cloth or swab. Cleaning solution analysis will be conducted by collecting a sample of the final rinse solution and subjecting it to laboratory analysis. Wipe and cleaning solution samples will be analyzed for volatile organic compounds, which represent the primary contaminants of concern at the Enviro-Chem site. If this testing indicates that contaminants are not being properly removed, the decontamination program will be revised accordingly.

9.1.2 Small Equipment Decontamination

- Small equipment, such as that associated with sampling or excavation (shovels, picks, chisels, hammers, etc), will be transported from the EZ or CRZ to the decontamination pad after use;
- Equipment will be washed with a high pressure spray;
- If the equipment does not appear to come clean, it will then be scrubbed down with soapy water using brushes and a phosphate-free soap. Equipment will then be rinsed, by hose, with water; and
- Equipment will then be allowed to air dry.

9.1.3 Large Equipment Decontamination

- Large equipment, such as backhoes, loaders, graders, dozers, and drill rigs, will be driven or carted from the EZ or CRZ to the decontamination pad;
- Equipment will first be washed with a high pressure spray;
- If the equipment does not appear to come clean, it will then be scrubbed down with soapy water using brushes and a phosphate-free soap. Equipment will then be rinsed, by hose, with water; and
- Equipment will then be allowed to air dry.

9.2 Personnel Decontamination

9.2.1 Personnel

Prior to any breaks, after exit from the EZ, personnel must wash hands and face, especially if any hand-to-mouth activities are expected (i.e., smoking, drinking, or eating).

All personnel who have entered the EZ or CRZ will be required to wash thoroughly at the end of the day before leaving the site. However, this requirement does not apply to those individuals entering the EZ or CRZ inside of a vehicle for brief periods (i.e., truck drivers), upon approval of the SHSO.

9.2.2 Equipment

Personnel decontamination will consist of soap and water washings to remove contaminants from reusable protective gear (i.e., neoprene boots, chemical-resistant gloves, and full-faced respirators). Disposable protective apparel will be removed in a manner that will prevent the spread of contaminants to other clothing (e.g., remove gloves by turning them inside out).

The detailed procedures for personnel decontamination will depend on the level of respiratory and dermal protection required for the specific work task. The general sequence of decontamination and removal of protective apparel is illustrated in Figures 9-1, 9-2, and 9-3 for PPE Levels B, C, and D, respectively. The extent of washing required or modifications to the sequence will be specified by the SHSO.

9.3 Community Public Health Preservation

The health concerns for the community are of utmost concern. Precautions undertaken to prevent any contamination from leaving the site will include:

- All equipment (mobile and portable) will be decontaminated before leaving contaminated areas;
- Suspended solids in surface runoff will be prevented from migrating off-site;
- Dust suppression techniques will be used, as necessary, to keep dust levels at a minimum.

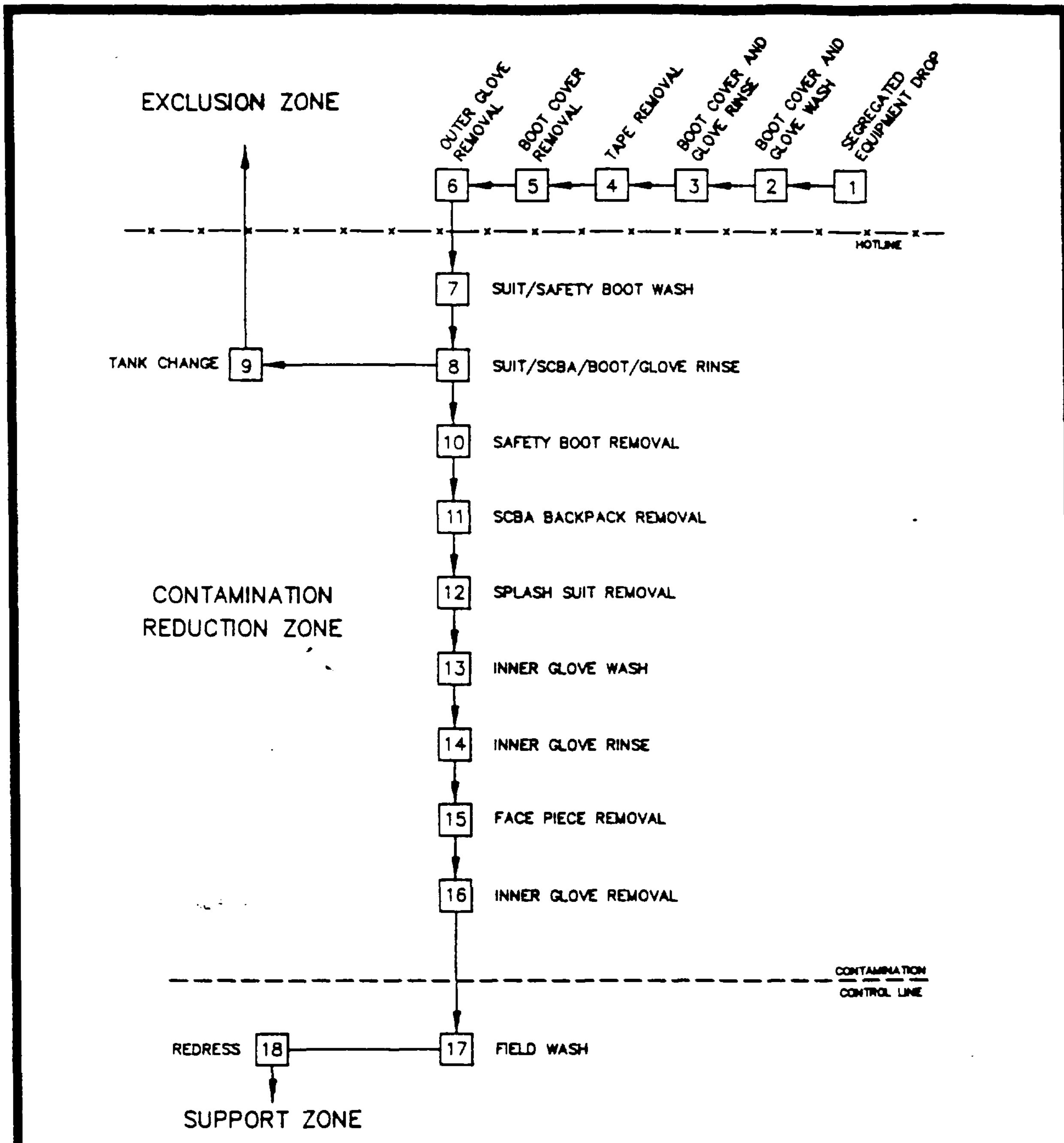


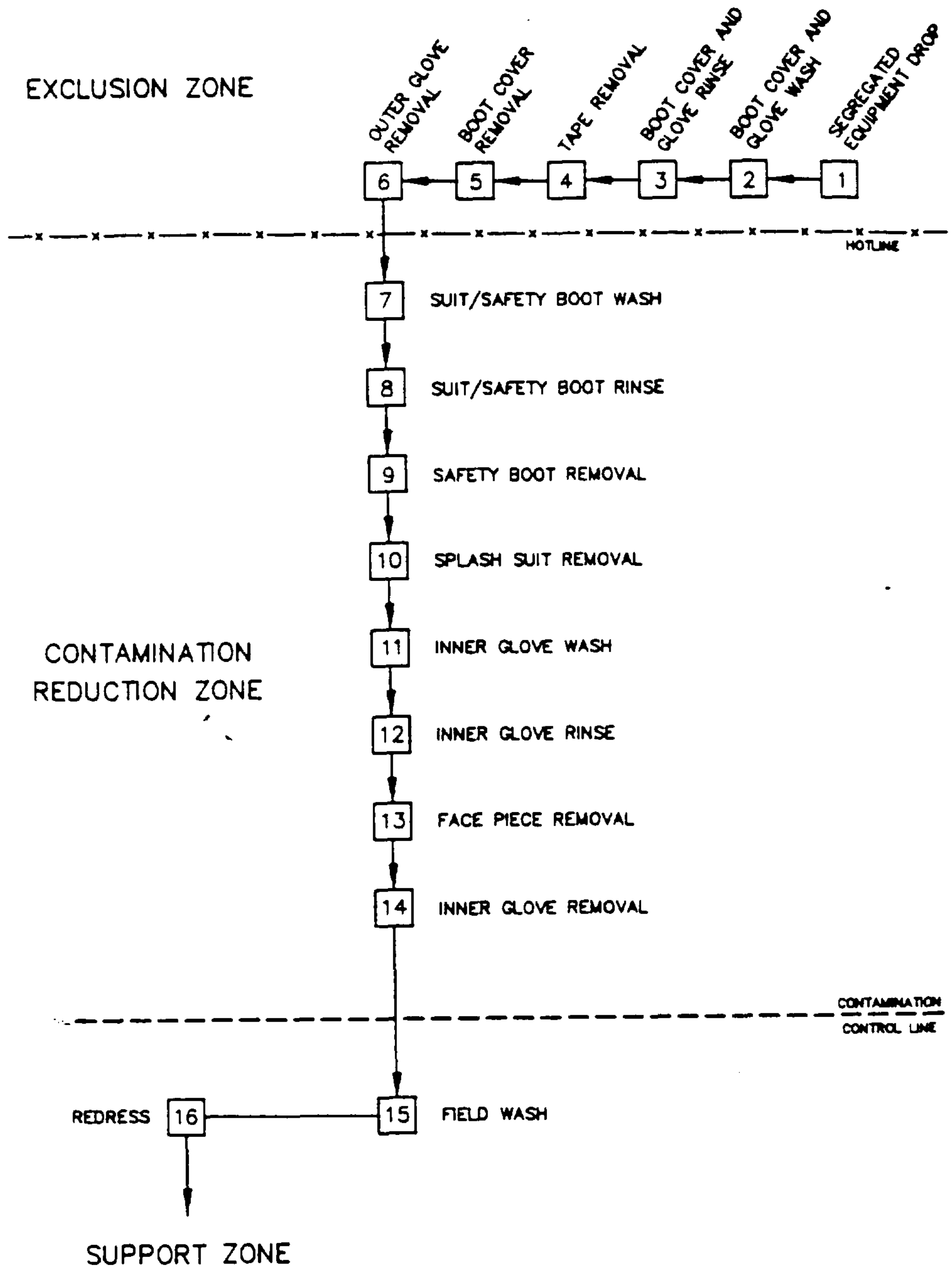
FIGURE 9-1
LEVEL B DECONTAMINATION PROCEDURES

HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

NOVEMBER 1997

Versar INC.



HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

FIGURE 9-2
LEVEL C DECONTAMINATION PROCEDURES

NOVEMBER 1997

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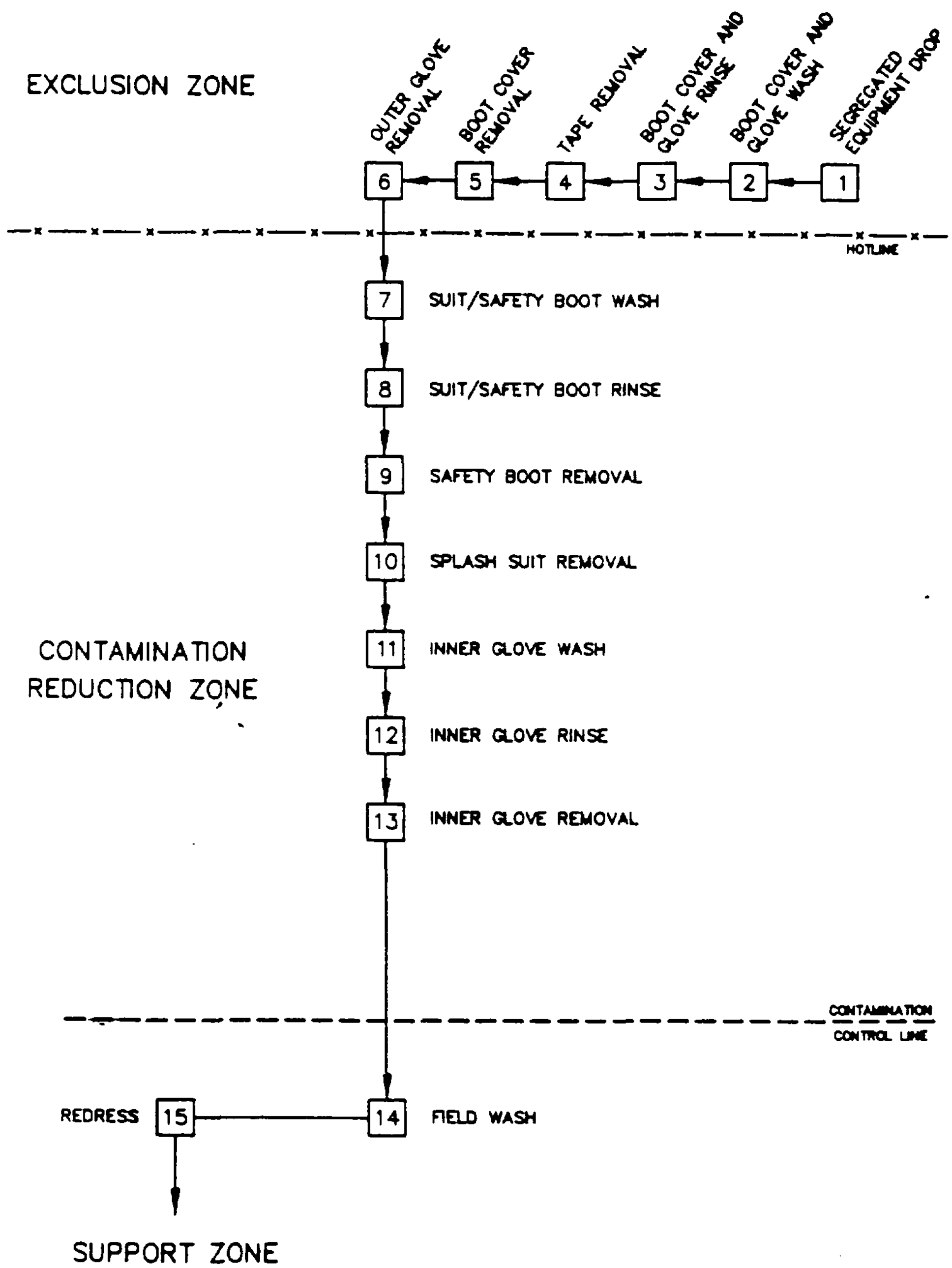


FIGURE 9-3
LEVEL D DECONTAMINATION PROCEDURES

HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

NOVEMBER 1997

Versar INC.

9.3 Community Public Health Preservation

The health concerns for the community are of utmost concern. Precautions undertaken to prevent any contamination from leaving the site will include:

- All equipment (mobile and portable) will be decontaminated before leaving contaminated areas;
- Suspended solids in surface runoff will be prevented from migrating off-site;
- Dust suppression techniques will be used, as necessary, to keep dust levels at a minimum.

10.0 STANDARD OPERATING PROCEDURES

10.1 General

The following Standard Operating Procedures (SOPs), engineering controls, and/or work practices will be enforced during work on-site:

- All personnel are responsible for complying with all applicable regulations (i.e., OSHA) for employing safe operating procedures while performing their duties. A copy of all applicable OSHA regulations will be kept on-site;

- All personnel will attend site-specific training prior to working/visiting in the EZ or CRZ;

- All personnel will conduct their activities in a manner pursuant to the contents of this HSP. Violations of HSP requirements will be brought to the attention of the Field Team Leader (TL) and the CS by the SHSO. If satisfactory results are not obtained, the CS and PM will be advised. Any violation of this HSP may be considered grounds for dismissal;

- All personnel will satisfy all medical surveillance requirements prior to working in an area where the potential for exposure exists;

- Any person using prescription or non-prescription drugs must first notify the SHSO so that it can be determined that these drugs do not potentiate the effects of site contaminants;

- No one may use cosmetics while on-site, as these can potentiate the effects of some chemical substances;

- Eating, drinking, smoking, chewing gum, or tobacco, or any other hand-to-mouth activities, will be prohibited in the EZ and CRZ, due to the potential for contaminant ingestion;

- Upon leaving the designated EZ, personnel will thoroughly wash their hands and face as soon as possible following personnel decontamination;

- Any unnecessary contact with potentially-contaminated substances will be avoided. This includes contact with potentially-contaminated surfaces and/or equipment. Monitoring instruments and other hand-held items are not to be placed on ground surfaces or other potentially-contaminated surfaces;

- No facial hair, which can interfere with achieving a satisfactory face-to-facepiece seal with respiratory protection equipment, will be permitted on any person required to use such equipment;
- Monitoring instrument action levels will be observed;
- If personnel note any warning properties of chemicals or even remotely suspect the occurrence of exposure, they will immediately notify the SHSO for further direction;
- Work cessation, due to electrical storms, high ambient heat loads, or other such adverse weather conditions, will be determined by the CS and SHSO;
- No open fires will be permitted;
- Site personnel will not undertake any activity which would be considered a confined-space entry without first being trained in the proper procedures by the SHSO and completing a confined space entry permit;
- Any areas targeted for subsurface investigation will first be investigated to determine the presence of underground utilities. This information is to be documented in the appropriate TL's logbook;
- No equipment will be operated within a 20-foot radius of energized power lines;
- No one, under any circumstances, will enter an excavation without a confined space/limited egress permit and adequate sloping and/or shoring;
- Site rules (e.g., buddy system, safety checks before leaving field office, before entering EZ, etc.) will be enforced;
- Eating and smoking will be prohibited in the EZ and CRZ;
- Wearing contaminated protective apparel in the SZ and restrooms will be prohibited;
- Before initiating any non-routine operation in any restricted area, all personnel will consult the SHSO about health and safety requirements for the operations;
- A buddy system will be implemented for all work in the EZ, including the activities during the pre-operational start-up period;

- Versar will provide an emergency shower facility for whole body washdowns and eye wash in the event of an emergency in conformance with ANSI Standard Z358.1-1981. The eye wash will supply a minimum of 0.4 gallons per minute (gpm) of water for 15 minutes;

- Physician-approved first-aid kits will be kept on-site during on-site work. At a minimum, one kit will be placed in the health and safety office;

- First-aid equipment will be approved by physician and be able to provide stabilization for patients requiring off-site treatment and general first aid;

- Versar will provide and maintain, at a minimum, one 20-pound Type ABC fire extinguisher at each work area. Additionally, all heavy equipment and all dedicated site vehicles will be equipped with a 10-pound Type ABC fire extinguisher;

- All work areas will be adequately illuminated by either natural or supplementary electrical lighting. The minimum illumination level in any active work area (i.e., active exclusion zone) will be 10-foot candles. All other areas of the Site will be illuminated according to the requirements of 29 CFR 1910.120(m);

- All electrical installations will conform to the National Electric Code, 29 CFR 1926 (Subpart K); and

- All loading and unloading of materials on-site will conform to the requirements of the U.S. Department of Transportation (DOT). These requirements will include grounding and bonding during flammable liquid transfers; proper placarding of any vehicle transporting hazardous materials from the site; ensuring all drivers meet DOT driver qualifications; and ensuring that all vehicles being loaded or unloaded are secured from inadvertent movement according to DOT and OSHA requirements.

10.2 Confined Space

Versar has prepared a corporate written program for confined space entry which meets the requirements of 29 CFR 1910.146. This program is included with this HSP as Appendix B. This program will be implemented prior to performing any activity which could be considered a permit required confined space entry (i.e. entering an excavation, cleaning out frac tanks, etc.).

10.3 Underground Storage Tanks (UST)

Upon determination of a UST present in the work area, all activities will cease in the immediate vicinity, and the CS notified immediately. No work around the UST will commence until an amendment to this HSP has been completed and approved.

10.4 Underground Utilities

If any underground utilities are unexpectedly located, all activity in the area will cease, and the CS will be notified. The CS will be responsible for contacting the appropriate utility company, if necessary. Work will not continue until a proper location of the existing utility can be attained and/or any damage repaired and work can continue in a safe manner without further damage.

10.5 Illumination

If practical, all major work tasks will occur during daylight hours. The illumination requirements set forth by OSHA in 29 CFR 1910.120(m) will be met during all activities.

10.6 Sanitation

10.6.1 Potable Water

- An adequate supply of potable water will be provided on-site by each subcontractor;
- Portable containers used to dispense drinking water will be capable of being tightly closed and equipped with a tap. Water will not be dipped from the container;
- Containers used to distribute drinking water will be clearly marked and not used for any other purpose;
- Common cups are prohibited for distribution of drinking water; single service cups will be required unless workers provide their own cups or a water fountain is available; and
- When single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups will be provided.

10.6.2 Non-Potable Water

- Outlets for non-potable water will be identified to clearly indicate that the water is unsafe and is not to be used for drinking or cooking purposes; and

- There will be no cross-contamination between potable and non-potable water systems.

10.6.3 Toilet Facilities

- The site will be provided with portable toilets with appropriate service; and

- Two toilet facilities will be provided for employees.

10.6.4 Food Handling

Food handling on the site will be permitted only in the SZ and break area, as delineated by the CS/SHSO. All personnel who have entered the CRZ or EZ will be required to wash hands and face before handling food or eating.

11.0 EMERGENCY RESPONSE PLAN

This section provides information regarding the actions to be taken by site personnel in the event of certain reasonably foreseeable emergencies. The information provided in this section should not be construed as all inclusive as each emergency situation may be unique and should not take precedence over professional judgements made during an incident.

11.1 Pre-Emergency Planning

Pre-emergency planning for this project involves the following:

- Development and approval of this ERP and a corresponding Spill and Discharge Control Plan (SDCP);
- Coordination of this ERP with local health and emergency response agencies;
- Training of site personnel in appropriate emergency procedures as part of the initial site training; and
- Modification of this ERP, whenever necessary, as conditions change.

The SHSO will meet with local fire (Zionsville), police/sheriff (Zionsville), ambulance (Zionsville), and hospital (St. Vincent) personnel to discuss emergency planning for the Enviro-Chem site. These meetings will take place prior to intrusive activities at the site. During these meetings, the local emergency response personnel will be briefed on potential hazards, anticipated types of emergencies, site activities to be performed, a tentative schedule for site activities, and procedures for emergency personnel access to the site. The CS will be identified as the primary point of contact for the emergency response personnel, and the SHSO will be identified as the secondary point of contact. Following these meetings, this ERP may be revised, as necessary.

11.2 Anticipated Types of Emergencies

Various emergency situations could possibly occur during remedial activities. These situations include:

- Fire/explosion;
- Personal injury/illness;

- Chemical spill(s); and

- Chemical releases to off-site receptors.

The remained of this section provides information and procedures to be followed in the event any of these scenarios occur (individually or in tandem).

11.3 Lines of Authority, Personnel Roles, and Communication

The lines of authority and responsibilities for emergency action will coincide with the health and safety responsibilities discussed in the HSP. The CS has overall authority for implementation of this ERP and all site emergency actions. This authority will be supplemented by input from the SHSO, who will act as second in command during emergency situations.

Specific roles and responsibilities to be carried out by site personnel will directly correlate to the nature of the incident. Site workers will be utilized to carry out the various response (or non-response) operations.

Communications during site emergencies will include the following:

- Site communications using alarms and radios; and

- Off-site communications with local health and emergency response agencies via telephones.

Each team working at the site, as well as the CS and SHSO, will carry portable two-way radios capable of communicating from a single site frequency. Additionally, as per the HSP, an air horn will be installed on-site to alert site personnel of emergency situations. The following signals will be used:

- Site Evacuation - One long blast for at least 10 seconds; and

- Emergency - Short blasts for at least 10 seconds.

Once the situation has been evaluated, local emergency response agencies will be notified, as necessary, via the telephone. Telephones will be located at the site office. Specific protocol, as to who is to be notified in the event of a site emergency, is presented in the emergency alerting provisions of this ERP (see Section 11.11).

11.4 Training

During site-specific training, all site personnel will receive the level of training necessary for them to safely and effectively carry out their roles as specified in this plan. Personnel who are merely to evacuate to a safe location during incidents will be provided with information regarding safe distances and places of refuge. Other persons, who will actually respond to the incidents, will be trained in the specific response procedures and equipment to be used, such as use of fire extinguishers and control and containment.

11.5 Emergency Recognition and Prevention

Many emergencies can be prevented by compliance with the HSP, the SDCP, and all relevant regulatory standards. However, it is recognized that such emergencies can arise. Visual observation, employee complaints, and/or air monitoring as per the AMP can aid individuals in identifying, recognizing, and initiating response to emergencies.

11.6 Safe Distances and Places of Refuge

Safe distances and places of refuge will correlate to the wind direction, topography, and the incident. Personnel will be advised to move to an upwind location, at least 300 yards from any fires and/or chemical releases, and will be advised to continually monitor wind direction for changes (the crew leader will account for respective personnel). If moving upwind from these types of incidents is not possible without encountering the incident and subsequent exposure potential, personnel will be advised to move crosswind or downwind to a distance necessary to be out of the path of smoke, odors, or releases. During personal injury/illness incidents (unless they involve fires or chemical releases), distances from incidents will be such to prevent interference with emergency response.

11.7 Site Security and Control

The Site Security Plan (SSP), included in the CSMP, will be initiated during the construction and operations phase of the Remedial Action. The security procedures on the site will be under the direction of the CS. The SSP includes provisions for access control, visitor documentation, and employee identification.

No entry into the SZ by unauthorized personnel will be permitted. All access gates into the SZ will be either locked or monitored to ensure only authorized personnel are permitted access. Unauthorized persons will not be permitted to enter the site. The CS and/or SHSO will coordinate the arrival of any outside emergency services. All gates to the SZ will be locked at the end of the work day.

11.8 Evacuation Routes and Procedures

All personnel will assemble at the primary rally point (i.e., the main contractor vehicle parking area noted on Figure 6-1), unless otherwise instructed, in the event that site evacuation becomes necessary. A secondary rally point will be identified (in the SZ). These rally points will be provided to all workers during the daily health and safety briefing. The CS will be responsible for roll call (i.e., personnel accountability).

11.9 Decontamination

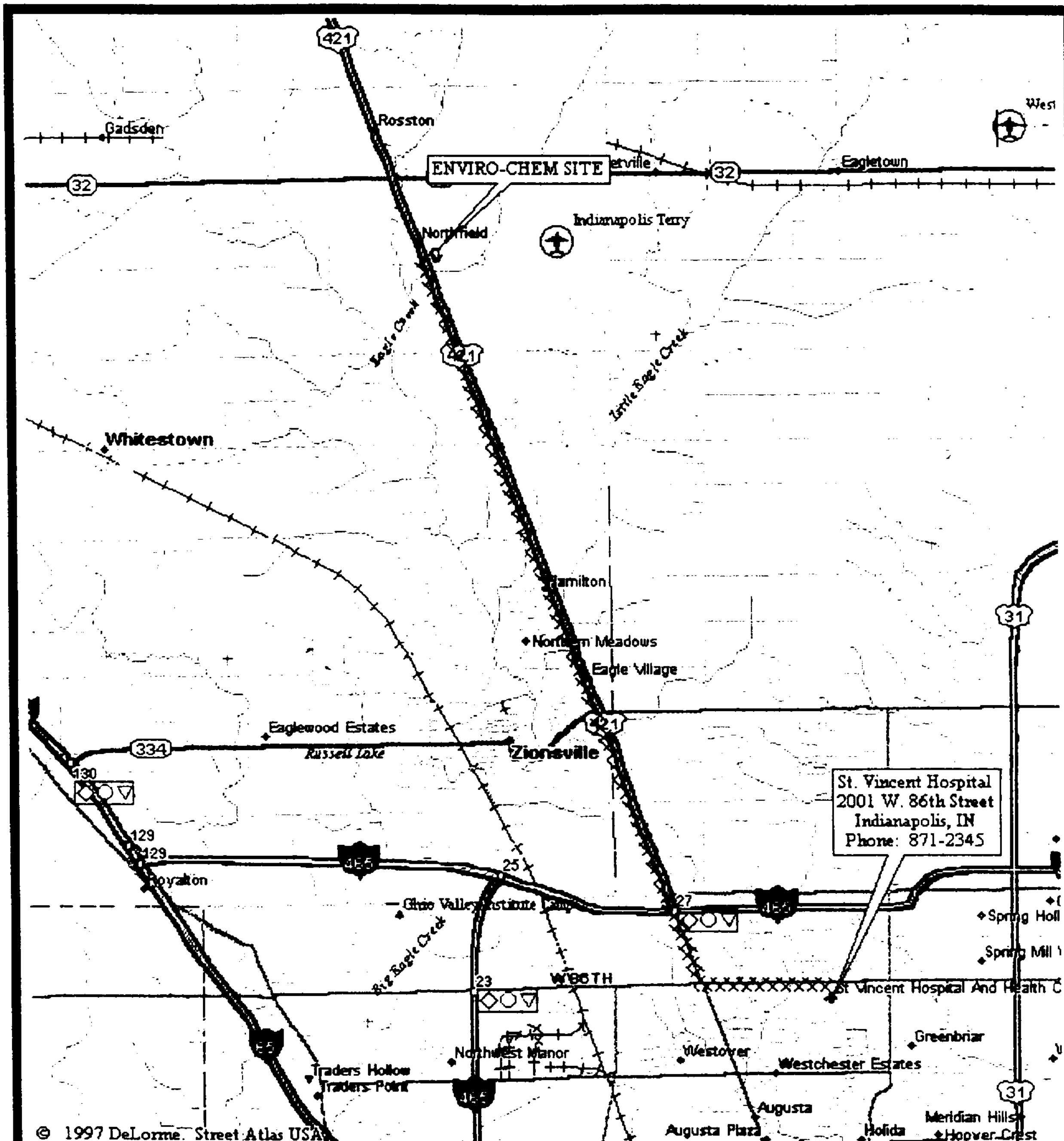
Decontamination during site emergencies will be the same as that for routine site operations, unless there is potential threat to human life or health. In such a situation, decontamination will consist of contaminated clothing removal and wrapping the injured party in a blanket. The vehicle used to transport the victim(s) to the medical facility will, therefore, be restricted in contacting contamination, and as such, should not be required to undergo decontamination.

11.10 Emergency Medical Treatment and First Aid

All emergency medical treatment, other than first aid, will be administered by the Paramedic Services dispatched through the emergency dispatch system. This treatment will continue during transportation to the hospital. All first aid will be administered on-site by the SHSO, or other designated representative, who is certified in CPR and first aid by the American Red Cross. Physician-approved first-aid supplies will be maintained at various locations throughout the project site. All vehicles used to transport injured persons to the off-site medical facility will be provided with directions and a map to the facility. Additionally, the HSP will accompany the affected individual to the emergency care center. Figure 11-1 illustrates the route to the hospital from the site.

11.10.1 Emergency Physician Access

In the event that any medical emergency arises due to work-related injuries/illnesses, a 24-hour emergency physician access plan will be established to enable any employee to communicate with the medical consultant. The SHSO will establish the emergency physician access plan during the pre-emergency planning meeting with St. Vincent Hospital. This plan will include identification of a physician/call service that is available to respond to emergencies 24 hours per day and each site worker will be provided with the emergency call number and emergency reporting procedures. The emergency physician access plan will also include the development of a medical emergency record for each site worker. These medical emergency records will summarize the health status of each site worker (e.g., pre-existing medical conditions, allergies to medication, etc.) and will be maintained on site and made available to the emergency physician. These records will assure that the emergency physician is aware of pre-existing medical conditions and potential treatment restrictions when the individual requiring medical treatment cannot speak for himself (e.g., if he is unconscious).



HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Source: DeLorme Street Atlas USA

FIGURE 11-1
HOSPITAL ROUTE MAP

NOVEMBER 1997

Versar INC.

11.11 Emergency Alerting Procedures

In the event of an emergency, the appropriate response agencies will be notified and appropriate project personnel will be notified as determined in advance. Table 11-1 provides the telephone numbers for the appropriate outside agencies.

11.12 Response Procedures (Priorities and Responses)

The following provides guidance toward prioritizing action and provides general response procedures to be followed. This information provides adequate information for the degree of response anticipated by employees. It is expected that personnel will only provide minimal or first line response to all emergencies.

11.12.1 First Priority

Prevent further injury/illness by:

- Protecting response personnel;
- Isolating the scene to authorized personnel only;
- Rescuing any injured parties; and
- Notifying Outside Emergency Assistance.

11.12.2 Second Priority

- Provide first aid to those persons with life-threatening injuries or illnesses.

11.12.3 Third Priority

Alleviate the immediate hazards by:

- Extinguishing incipient stage fires;
- Reducing chemical releases; and
- Containing any spill.

11.12.4 Fourth Priority

- Provide first aid to all injured or ill parties and continue efforts to alleviate the hazard.

Table 11-1. Emergency Reference Numbers

This site location (EMS address):	985 South State Route 421 (Rear of Property) Zionsville, Indiana	
Emergency Information	Location	Telephone Number
Office	Indianapolis	(317) 469-0703
Ambulance	Zionsville	(317) 873-3363
Hospital Emergency Room	St. Vincent	(317) 388-2121
Hospital General Information	St. Vincent	(317) 871-2345
Police/Sheriff's Department	Zionsville	(317) 873-2233
Fire Department	Zionsville	(317) 873-3344
HAZMAT Team (Local)	Zionsville	(317) 241-4336
Poison Information Center	National	1-800-762-0727
National Response Center for Environmental Emergency Only	National	1-800-424-8802
Boone County Health Department	Boone County	(317) 482-3942
ECC Trustees, Norman Bernstein	Washington, DC	(202) 466-8100
Project Manager, George Anastos	Bristol, PA	(215) 788-7844, Ext. 222
Construction Manager, Charles Gaffney	Bristol, PA	(215) 788-7844, Ext. 237
Site Health and Safety Officer	On-Site	TBD
Corporate Health and Safety Officer	Springfield, VA	(703) 642-6891
IDEM Emergency Response	Indianapolis	(317) 233-7745
ECC On-Site Engineer, Mark Colona	On-Site	TBD
U.S. EPA Project Manager, Mike McAteer	Chicago	(312) 886-4663
General Emergency Services	N/A	911

11.13 Small Fires

A small fire is defined as a fire that can be extinguished with the available 20-pound type ABC fire extinguisher. In the event of a small fire, the following minimum actions will occur:

- Evacuate all unnecessary personnel from the area, if possible, to an upwind location or to an area not affected by airborne contaminants if an upwind location is not feasible;

- Attempt to extinguish fire using portable fire extinguisher or by smothering;

- Request emergency response assistance (i.e., ambulance, fire, hospital, poison control center) as needed for any injuries or exposures to hazardous chemicals; and

- Notify the CS.

11.14 Large Fires

In the event of a large fire or a small fire which cannot be extinguished, undertake the following minimum actions:

- Evacuate all unnecessary personnel from the site, preferably to an upwind location;

- Order the appropriate level of protective clothing to be worn by personnel near the fire;

- Notify the fire department and other emergency response services (i.e., police, ambulance, hospital, poison control center) as needed; and

- Notify the CS.

11.15 First-Aid Procedures

11.15.1 Physical Injury

- For minor injuries, routine first-aid procedures will be used immediately. If required, the patient will be transported to the hospital;

- For major injuries, an ambulance will immediately be called and paramedics will assess the nature and extent of the injury. In case of severe injury occurring along with chemical contamination of the victim, the victim will be sprayed down with a water hose, or have the contaminated garments removed, or be wrapped in a blanket to prevent the spread of contamination, prior to being transported in the ambulance; and

- In the event of bleeding, broken bones, shock, burns, heat exhaustion, heat stroke, seizure, insect stings, etc., the trained personnel will use Red Cross approved measures for treatment.

11.15.2 Chemical Injury

- Appropriate safety gear will be worn when treating the victim;
- The victim will be removed to fresh air and resuscitated, if necessary;
- If clothing is chemically contaminated and injuries permit, clothing will be removed and the skin flooded with copious amounts of water;
- If the eyes are contaminated, they will be irrigated immediately with copious amounts of water for 15 minutes minimum; and
- The nearest Poison Control Center will be contacted for technical advice and assistance.

11.16 Emergency PPE and Equipment

The following inventory of PPE and equipment will be maintained on-site in sufficient quantities and locations to ensure an adequate supply for all emergency response personnel and to ensure that it is readily accessible:

- Industrial first-aid kit - one in the main CRZ and one in the site office;
- Eye wash and deluge showers - located near each work area and the main CRZ;
- Stretchers - located at the support zone;
- Fire extinguishers - located at the entrance to each work area and in all trailers;
- Pressure-demand self-contained breathing apparatus - two or more;
- Four spare cylinders for SCBAs;
- Saranex or other acceptable laminate coveralls;

- Boot covers;
- Nitrile outer gloves;
- Duct tape;
- Face-shields; and
- Solvent- and oil-absorbent pads and booms.

11.17 Emergency Response Drills and Critiques

Emergency response drills will be conducted periodically throughout the course of work to be used as measures for evaluating the effectiveness of this ERP and response personnel. Each drill will be critiqued by one or more observer. The critique(s) will then be used to modify, as necessary, the ERP emergency equipment and/or response training.

12.0 SPILL RESPONSE, CONTROL, AND CLEAN-UP

This section provides contingency procedures to respond to spills of construction-related materials (solid or liquid) at the site. These procedures are designed to remediate contamination that may result from a spill and to prevent further contamination of surface water, groundwater, soil, structures, equipment, or other materials.

12.1 Spill Control Equipment

Spill control equipment and clean-up materials will be on-site and readily available in the event of a spill. Storage locations for spill control equipment and clean-up materials will be determined in the field during mobilization. Storage locations will be clearly identified. These locations may be relocated as construction activities shift. In addition, individual pieces of equipment may be moved from one location to another based on ongoing construction activities.

12.2 Training

Only persons trained in accordance with OSHA 29 CFR 1910.120(e)(7) will be equipped with the proper personal protective equipment and will perform clean-up procedures for spills. At a minimum, Versar will have one representative on site, at all times, that has received emergency response/first responder training in accordance with 29 CFR 1910.120(e)(7). The SHSO will determine the level of protection needed for a spill incident based on the circumstances. The air monitoring action levels presented in Section 8.3, Real-Time Air Monitoring, will be followed during any spill clean-up.

Persons involved in spill control and clean-up will be trained in the use of spill control equipment and clean-up materials.

12.3 On-Site Spill Response Procedures

In the event of a spill of potentially contaminated material, the procedures described below will be implemented.

12.3.1 Notification

Versar will immediately notify the U.S. EPA Project Manager, the Engineer, and the ECC Trustees of a significant spill, if it threatens the off-site environment. If the spill is reportable and/or human health or the off-site environment are threatened, Versar will immediately contact the following agencies, as appropriate, in the order listed:

- Indiana Department of Environmental Management (IDEM), Emergency Response;

- Citizen Notification Contact as specified by the U.S. EPA Project Manager;
- U.S. EPA Region V Response and Prevention (Spill Control); and
- U.S. Coast Guard National Response Center.

12.3.2 Spill Control/Containment

In the event of a spill, the first step will be to contain the spill to one area and prevent it from entering any natural or manmade waterways, such as streams, manholes, and catch basins. To contain the spill, a dike will be placed around the source of the spill. The dike will be constructed of absorbent material or dirt. A common practice is to form a second dike around the first dike in case there is more material than the first dike can contain.

Once the area around the spill is contained, the source of the spill will be stopped by plugging, turning off the shutoff valve, and overpacking. This will only be attempted by trained persons to minimize risk to workers' personal safety.

12.3.3 Spill Clean-Up

Once the spill is contained and controlled, the actual clean-up of the material can begin. Absorbent materials, such as speedi-dry, absorbent pads, pillows, and booms, will be used to absorb liquid material. Sand may also be used. Spark-resistant shovels will be utilized when picking up potentially contaminated materials.

Cleaned up materials will either be packed in drums or placed on a polyvinyl liner and covered with a polyvinyl cover.

12.3.4 Decontamination of Equipment/Structures/Materials

Any spill control or construction equipment, on-site structures, or other materials which come into contact with the spilled material will be decontaminated, as necessary. Complete clean-up may require showers and cleansing or disposal of clothing and equipment.

12.3.5 Disposal

All contaminated materials, including solvents, cloth, soil, and wood that cannot be decontaminated, will be properly containerized, labeled, and disposed of as soon as possible and in accordance with applicable federal, state, and local regulations. Disposal will be coordinated with provisions of the Materials Handling procedures presented in the Environmental Protection Plan.

12.3.6 Spill Incident Report

A spill incident report will be submitted to the U.S. EPA Project Manager and IDEM within 24 hours of the incident. This report includes information on the date the spill occurred; the type, quantity and location of spilled material; the cause of the spill; clean-up actions; and outside agencies involved.

In addition to the spill incident report, Versar's CS will document all spills on site drawings and submit these drawings to the U.S. EPA Project Manager and IDEM when the project is completed.

12.4 Response to Off-Site Spills

Despite all precautionary measures, the possibility exists that spills of decontamination water or wastes being transported off-site may occur. The following subsections describe contingency procedures to respond to such incidents.

12.4.1 Decontamination Water

Because decontamination activities and treatment of decontamination water will be performed on-site, it is anticipated that any spills of decontamination water will be on-site. In the event that a spill of decontamination water occurs at the site perimeter and some liquid escapes beyond site boundaries, the emergency equipment and clean-up material on-site will be utilized to respond to both the on-site and off-site portions of the spill.

12.4.2 Transportation-Related Wastes

All contaminated waste material destined for off-site disposal will be transported by a licensed hazardous waste transporter. Before awarding the subcontract, Versar will confirm that the transporter has a current, valid hazardous waste transporter identification number. Versar will also verify that the transporter has an established contingency plan to respond to a transportation-related spill. The Engineer must approve the off-site transporter and disposal facility.

Clean-up of spills of waste material being transported off-site will be the responsibility of the transporter. If requested, Versar will provide additional information on the spilled material (if available) to enable a more expeditious clean-up.

If a discharge of material from a transporting vehicle occurs while in transit off-site, the following actions are expected to be taken to reduce potential migration of the waste material:

- The driver will immediately notify his office and the Versar CS;

- Immediate measures will be taken to contain the discharge;

- The point of discharge will be secured and/or eliminated, if possible;

- The driver will remain with the vehicle, keep unnecessary people away, isolate the hazardous area, and deny entry to unauthorized personnel;

- All personnel will stay upwind, keep out of low areas, and avoid contact with the spilled material as much as possible;

- Local authorities and the local hazardous materials response unit will be contacted; and

- Other actions will be taken, as advised.

Notifying the proper authorities that a transportation-related spill has occurred is the responsibility of the transporter. After the transporter informs Versar's CS of a spill, the CS will notify the U.S. EPA Project Manager, IDEM, and the Engineer. The CS will provide additional information as it becomes available.

13.0 ON-SITE REFERENCES, DOCUMENTATION, RECORDKEEPING AND REPORTING

The following section provides requirements and procedures that will be instituted for on-site health and safety references, documentation, recordkeeping, and reporting.

13.1 Required References

The following reference material will be present in the health and safety file in the site trailer:

- Versar's Corporate Health and Safety Manual;
- Health and Safety SOPs;
- Health and Safety Plan;
- Current ACGIH TLV Booklet;
- Current NIOSH/OSHA Pocket Guide;
- Operational Manual for all health and safety equipment;
- 29 CFR 1910;
- 29 CFR 1926;
- NIOSH/OSHA/USCG/U.S. EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"; and
- American Red Cross First Aid and CPR Instructional Manuals.

13.2 Required Documentation

- Written Hazard Communication Program, which includes Hazardous Material Inventory and MSDSs. The Hazard Communication Program must be completed within 10 working days after notice to proceed with field work is given. The written program will be made available to the Engineer after such time;

- Applicable training records of all site workers for the following:
    - 40-hour introductory course,
    - 8-hour supervisory course,
    - 8-hour refresher course, and
    - Site-specific training;

- Medical clearance for all site workers;

- Calibration/measurement logs for all site health and safety equipment;

- Health and safety logbook;

- Air Sampling Results Report, including the following information:
    - Date,
    - Type of equipment used,
    - Equipment identification,
    - Analytical results,
    - Personnel and/or area sampled,
    - Description of remedial activity,
    - Sample Number, and
    - Miscellaneous information;

- Respiratory Protection Program which meets the requirements of 29 CFR 1910.134 (see Appendix A);

- Personal Protective Equipment Program which meets the requirements of 29 CFR 1910.120 (see Appendix A);

- Hearing Conservation Program which meets the requirements of 29 CFR 1910.95. The Hearing Conservation Program is included within Versar's Corporate Health and Safety Manual; and

- Fit-test records for all employee on all types of respiratory protection available on-site.

13.3 Daily Information

The following information will be documented on a daily basis for each site worker:

- Operation(s) performed;
- Time spent on each operation (± ½ hour); and
- PPE used for each operation (specific).

The following information will be documented on a daily basis for each operation:

- Monitoring equipment used;
- Range (maximum and minimum) for each monitor; and
- Average reading for each monitor.

The following information will be documented on a daily basis for the overall project:

- Environmental conditions (i.e., temperature, precipitation, cloud cover, wind speed, wind direction, etc.);
- Attendance of employees;
- Site visitors (include name, affiliation, areas/operation observed, PPE used, training/medical release, and site training received);
- Observations regarding health and safety of each operation;
- Health and safety problems encountered:
  - Personnel
  - Equipment
- Telephone/site meetings
  - Health and safety concerns discussed
  - Health and safety decisions and rationale

This information will be recorded in the Daily Health and Safety Report, which is included as Appendix D.

13.4 Training Logs

The training log(s) will include both initial training, follow-up training, and visitor training. These logs will include:

- Date;
- Employee's name (attendance check) and record of attendance;
- Materials covered;
- Fit-testing performed and results; and
- Trainer(s)'s signature.

13.5 Accident/Incident Reports

- Injuries, off-site releases, or accidents will be reported to the HSO immediately, or as soon after control of the situation as possible.

The responsibility of this recordkeeping and reporting rests with the CS, although the SHSO will complete the reports with assistance from on-site administrative personnel. Note that since both a health and safety logbook and logs/reports will be kept, the SHSO has the option to incorporate completed logs/reports by reference into the health and safety logbook. All documents will be kept on-site in the health and safety file.

APPENDIX A

VERSAR'S RESPIRATORY PROTECTION AND PROTECTIVE EQUIPMENT PROGRAMS

7.0 RESPIRATORY PROTECTION PROGRAM

7.1 OSHA Requirements

The Respiratory Protection Program is designed to fulfill the requirements of the Occupational Safety and Health Administration's (OSHA's) respiratory protection standard 1910-134:

> Whenever possible, engineering, administrative, and work practice controls shall be instituted to reduce airborne hazards. Where this is not possible or while such controls are being implemented, the appropriate respirator may be used to protect employees.

7.1.1 Establishment of Authority

Versar, Inc., is responsible for the establishment and administration of the Division's Respiratory Protection Program. The program will be implemented by the Division health and safety officer. The project manager will also be responsible for the implementation of the program and will ensure compliance with the requirements of this program on an individual project basis.

7.1.2 Respiratory Program Information Availability

Copies of the Respiratory Program and other sources of information on respiratory protection will be made available to all employees.

7.1.3 Division Health and Safety Officer

The Division Health and Safety Officer will act as the "Respiratory Safety Officer" for each division.

7.1.4 Requirements for Respiratory Safety Officer

- Adequately trained in all aspects of respiratory protection.
- Capable of monitoring the workplace for various contaminants.
- Background of technical and professional knowledge that will enable them to make professional judgments based on hazard evaluation input from the workplace.

7.1.5 Safety Officer Responsibilities

- Provide technical assistance to determine the types and concentrations of air contamination.
- Respirator selection.
- Training workers in the proper use of respirators.
- Respirator fitting.
- Maintenance and cleaning procedures.
- Purchasing and inventory control, including maintaining spare component parts for respirators.
- Medical surveillance of employees using respiratory protection devices.
- Documentation (e.g., recordkeeping).

7.1.6 Project Manager

- Ensure review of scope of hazard and respiratory protection requirements with Safety Officer before start of each job.
- Ensure review of scope of hazard and respiratory protection requirements with crew before start of each job.
- Ensure monitoring of workplace.
- Ensure conduct of respirator fit-tests.
- Ensure the individuals in their charge comply with rules governing the use of respiratory protective devices.

7.1.7 Employee Responsibilities

- Comply with all safety procedures and regulations governing the use of respiratory protective devices.

- Ensure that the respiratory devices in use fit properly.

- Maintain, inspect, and clean respiratory devices according to the manufacturers' directions and guidelines of this program.

- Inform each supervisor of the actual or potentially hazardous conditions.

7.1.8 Requirements for Use of Respirators

- Each person assigned a task that requires the use of a respiratory protective device must fulfill all requirements and follow procedures as specified by this Respiratory Protection Program.

- Certification by physician.

- Training Program:

  Prior to being assigned a respiratory protection device, each employee will receive hands-on training in the care, use, and limitations of such devices. Training sessions will cover:

  - Concepts of fit-test,
  - How to recognize a poor mask-to-face seal and corrective actions, and
  - Nature and scope of hazards for which respiratory protection is required.

7.1.9 Selection of Respiratory Protection

- Only NIOSH/MSHA-approved respiratory protection devices and their components and replacement parts will be purchased or used.

- Single-use or disposable respiratory protection devices will not be used.

- The degree of respiratory protection chosen for each job will be based on the hazards or suspected hazards to which the worker will be exposed.

- The Safety Officer or Field Supervisor will determine what type of respiratory protective device is adequate by using material safety data sheets, hazard assessment sheets, direct monitoring instruments, and from additional information gathered.

- The 3M Respirator Selection Guide will serve as a basic guide when selecting respiratory protective devices.

- The highest level of respiratory protection will be achieved through the use of a positive pressure self-contained breathing apparatus (SCBA), or the use of an airline respirator operated in the pressure demand mode and is equipped with an escape SCBA.

- Lower levels of respiratory protection will be achieved through the use of other forms of airline respirators, powered air-purifying respirators (PAPRs), and fullface air-purifying respirators with the proper cartridges, filters, or canister, and by qualitatively or quantitatively fit-testing the individual.

- The lowest level of respiratory protection will be achieved through the use of half-face, air-purifying respirators with cartridges that have been qualitatively fit-tested.

- The Safety Officer or Field Supervisor will consider the skin as a source of exposure and will see that action is taken to prevent skin exposure through the use of fullface respirators, protective clothing, and gloves.

- Higher forms of respiratory protection device will be used if devices described in the tables are not, or cannot be, provided.

7.1.10 Self-Contained Breathing Apparatus

- The use of pressure demand SCBA may be necessary when it is determined that other means of protection are inadequate.

- SCBA will be used when the type of airborne contaminant and/or concentration is unknown, and/or the air is oxygen deficient, and/or toxic air contaminants exist in concentration immediately dangerous to life or health (IDLH).

- Employees using SCBA will have attended special training sessions on its use and the differences between these units and the air-purifying respirators.

7.1.11 Air-purifying Respirators

- Fullface respirator: Used when the type of airborne contamination is known, concentration-measured criteria for using this type air-purifying respirator are met, and when exposure to other hazardous contaminants is unlikely.

- Half facepiece respirator: Same use conditions as the fullface respirator, but used when skin exposure and eye irritation are not a problem. Lower level of respiratory protection is provided.

7.2 General Requirements Governing All Forms of Respiratory Devices

- Respirators, with the exception of SCBA, will be assigned to each individual for his or her own use.

- Respirators will only be used for assigned tasks. They will not be taken home and used for personal tasks.

- Facial hair in the forms of beards, mustaches, sideburns, and stubble will not be permitted if the hair comes between the facepiece sealing surface and the face.

- Petroleum jelly, face creams, and powders will not be used to achieve a respirator facepiece to face seal.

- Gum or tobacco chewing is prohibited when wearing a respiratory device.

- Contact lenses will not be worn while wearing any form of respiratory device. Special corrective lenses will be provided.

- Fullface respirator will be employed when goggles or spectacles interfere with half-mask sealing.

- Fit-testing will be performed before entering a contaminated environment (see paragraph 7.4).

- Individuals will use only the respiratory protection devices for which he or she has been given proper training and fit tested.

- Tasks requiring respirators will be performed in pairs.

- Visitors and other non-employees are prohibited from entering areas where respiratory devices are required.

- Air-purifying respirators with cartridges will be used for only contaminants that the cartridge is approved for.

- Air-purifying cartridges, filters, and canisters will be discarded at the end of the work shift, when breathing becomes difficult, or when the odor of the contaminant is detected. The Safety Officer is empowered to provide more definitive guidance depending on the situation.

7.2.1 Procedures for Issuance of Respirators

- Respirators will be issued by the Division Safety Officer or his designee who will assign a respirator to each employee for his or her own use, with the exception of an SCBA, which is issued to more than one person. Each employee will be certified as medically able to wear a respirator; will have completed a course of instruction in the care, use, and limitations of a respirator; and will have successfully been fit-tested for a respiratory device by the Safety Officer or his designee prior to initial respirator use.

- The procedures will be documented on Form 184 and will be maintained by the Safety Officer. A copy will be given to the employee for his or her records.

7.3 Fit Testing

- The fit-test must be performed to ensure the adequacy of the seal between the face and the facepiece sealing surface before a respiratory protection device is issued or used. A specific respirator (size, brand) will be specified for a worker fit tested. A fit test card will be issued and fit test results recorded on the Fit Test Form 183, Figure 7-1.

- Failure to pass a fit-test is a sign of inadequate face to facepiece seal. Those not passing a fit-test will not be issued a respirator and will be prohibited from entering a hazardous environment until a proper fitting respirator is obtained, or the physical condition preventing a good seal is corrected.

Versar INC

FIGURE 7-1
USER TRAINING, MEDICAL CLEARANCE,
INITIAL FIT TEST - FORM 184

On ____________, _____, ______________________
has received hands-on training in the care, use, and limitations of the following respiratory protection device(s):

____ SCBA
____ Fullface Air Purifying Respirator
____ Half-face Air Purifying Respirator
____ Other

__________________ has also been instructed and trained in the proper fit-test methods for the above marked respiratory device(s).

On ____________, _____, ______________________
has satisfactorily passed the irritant smoke test for the following respiratory protection device(s).

MANUFACTURER	TYPE OF DEVICE	UNIT NO.	INSTRUCTOR'S SIGNATURE

At the examination on ____________, _____, no contra- indictions to the use of the above form(s) of respiratory devices have been identified. Physician's certificate on file.

Employee's Signature __________________

RETURN TO DIVISION HEALTH AND SAFETY OFFICER

7.3.1 Qualitative Fit Tests

- The two qualitative fit-tests (QLFTs) are the irritant smoke test and the odorous vapor test.

- A qualitative fit test will be performed for all forms of respiratory protection devices prior to a respirator being issued, and prior to starting work in a hazardous environment.

- Each time a qualitative fit-test is performed, it will be recorded on Form 384.

- The taste test or sodium saccharin test will not be used for qualitative fit testing.

7.3.1.1 Irritant Smoke Test

- Irritant Smoke QLFT procedures are detailed in the Appendix.

- Decisions based on the test:

  - Indication of the smoke by the test subject indicates a poor face to facepiece seal.

  - If any doubt about the condition of the respirator or filter exists, the respirator will be visually inspected, and another like respirator will be tested to ensure that leakage was due to a poor face to facepiece seal.

  - Persons not passing an initial or a a routine smoke test are prohibited from starting work in a hazardous environment until conditions preventing a good seal are corrected.

7.3.1.2 Odorous Vapor Test

- Odorous Vapor QLFT procedures, using isoamyl acetate are detailed in the Appendix.

- Decisions based on the test:

  - Indication of the odorous smell by the test subject indicates a poor face to facepiece seal.

- If any doubt about the condition of the respirator or the cartridge exists, the respirator will be visually inspected and another like respirator will be tested to assure the leakage was due to an inadequate face to facepiece seal.

7.4 Field Test Method

The positive and negative pressure sealing tests will be performed in the field every time a respirator is donned. However, these tests may not be substituted for the QLFT.

7.4.1 Negative Pressure Test

- The inlet opening of the respirator's cartridges, filters, or canister is closed off by covering with the palms of the hand, by replacing the inlet seal on a canister, or by squeezing or blocking a breathing tube inlet so that it will not allow the passage of air.

- The wearer is instructed to inhale gently and to hold his or her breath for at least 10 seconds. If a facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it is reasonable to assume that the respirator has been properly donned and the exhalation valve, breathing tube, and facepiece are not leaking.

7.4.2 Positive Pressure Test

- The exhalation valve, breathing tube, or both are closed off and the wearer is instructed to exhale gently. The respirator has been properly donned if a slight positive pressure can be built up inside the facepiece without the detection of any outward leakage of air between the sealing surface of the facepiece and the wearer's face.

7.4.3 Field Test Failure

- If leakage is detected in either negative or positive pressure test, the respirator facepiece and/or headband will be readjusted until a satisfactory seal is obtained. If a satisfactory seal cannot be obtained, report to the Safety Officer. A different respirator is needed and a QLFT must be performed.

7.5 Care of Respiratory Protective Devices

7.5.1 Maintenance

- All respiratory protective devices will be maintained by the individual with assistance from the Safety Officer.
- Only individuals holding a certificate of instruction from a self-contained breathing apparatus manufacturer will make repairs to SCBA units on which they hold said certificate.
- A supply of replacement parts, cylinders, cartridges, filters, and canisters will be maintained by the Safety Officer for each respirator type used.

7.5.2 Wipe Cleaning

- Individuals will wipe clean their respirator whenever leaving the work zone temporarily.
- Procedure: Wipe the outside surface first with a "SaniCom" pad to remove base dust or dirt. Inside sealing surfaces are then wiped with a clean SaniCom pad. A tag may be attached to indicate that it has been wiped clean.
- Alcohol or alcohol pads will not be used for wipe cleaning or complete cleaning.

7.5.3 Complete Cleaning

- Respirators will be completely cleaned at the end of each work task.
- Complete cleaning is to be performed by the individual and is to include disassembly, washing, disinfection, inspection, reassembly, and storage.
- Respirators will not be taken home for cleaning.

7.5.4 Disassembly

- Remove and dispose of cartridges, canisters, or filters unless otherwise directed by Safety Officer.

- Remove all gaskets that are not affixed to seats.
- Remove exhalation valve cover and exhalation valve, if removable.
- Remove inhalation valve, if accessible.
- Do not disassemble regulators on SCBA, unless trained to do so.
- Remove breathing tubes that are not affixed to the facepiece.
- Remove high-pressure line between cylinder and regulator. Before removing line, be sure the cylinder valve is closed. This is done by checking the regulator pressure gauge.
- Remove cylinder from backpack for cleaning inspection and refilling.

7.5.5 Washing and Disinfection

- Alcohol will not be used as a disinfectant.
- MSA Cleaner-Sanitizer II is the cleaning disinfectant agent of choice.
- Follow the manufacturer's directions for using the cleaner-sanitizer.
- Wash all respirator parts including the breathing tube in warm (120°F) water with the appropriate amount of cleaner-sanitizer.
- A sponge or plastic bristle hand brush is useful in removing dirt from respirator and parts.
- First rinse the outside of facepiece and breathing tube in warm (120°F) water; rinse the inside of facepiece and breathing tube.
- Shake the facepiece and stretch the breathing tube to release excess water.
- Allow the facepiece and breathing tube to air-dry.
- Do not attempt to force-dry the facepiece or breathing tube with a blow dryer or by placing near a heater or in direct sunlight.

- Use a soft, lint-free rag to wipe any wash/rinse residue from inhalation and exhalation valve seats.

7.5.6 Inspection During Cleaning

- Procedures outlined in the basic inspection procedure section will be used.

- Respirators will be inspected after cleaning operations and reassembly have been accomplished. Following the Basic inspection procedures and manufacturer's instructions.

- Leak checking will be performed to determine if complete assembly is gas tight.

7.5.7 Re-assembly

- After the cleaned respirator has been inspected, re-assemble with serviceable parts from disassembly. Replace any parts needed with parts from the respirator manufacturer.

- DO NOT mix and match parts from different respirator manufacturers. The respirator might not protect. The NIOSH certification is voided with mixed parts.

7.5.8 Storage

- After cleaning, each assembled facepiece will be stored in a clean plastic bag sealed by a twist tie or zip lock, and the date of cleaning will be marked on the outside of the bag.

- SCBA units will be placed back in their protective cases.

- Bagged facepieces will be stored on hooks, shelves, or in cases in such a way that no deformation of critical parts can occur.

- If cartridges are attached, the date is to be recorded on the cartridge.

7.5.9 Basic Safety

- Return to the staging area if you experience problems with a respiratory protective device.

- Return to the staging area if you detect any odor entering facepiece; if there is excessive breathing resistance; or if you feel faint, dizzy, or nauseous.

- Never remove or pull the respirator device away from the face when in a contaminated environment.

- Use only the respirator devices assigned to you.

- Return to staging area when forced to use the bypass valve on SCBA, when the pressure alarm starts to ring, or when the exhalation valve on SCBA remains open.

7.6 Inspection Procedures

7.6.1 Routine Inspection

- Frequently used respirators will be routinely inspected before and after each use by the user of the device.

- Respirators not used routinely will be inspected after each use and at least monthly.

- Inspections will be performed in accordance with the manufacturer's instructions.

- All inspections will be recorded on Form 584 for daily use and on Form 484 for monthly inspections.

7.6.2 Air-purifying Respirators and SCBA

- Examine facepiece for:

  - excessive dirt
  - cracks, tears, holes, or physical distortion of shape from improper storage
  - inflexibility of rubber facepiece
  - cracked or badly scratched lenses in full facepiece
  - incorrectly mounted full facepiece lens
  - cracked or broken cartridge receptacle

- badly worn threads and/or missing gaskets

- Examine head harness for:

    - breaks
    - loss of elasticity
    - broken or malfunctioning buckles and attachment
    - excessively worn serrations on head harness that might permit slippage

- Examine the exhalation valve for the following problems after removing the valve cover. Note on SCBA: The cover cannot be removed without the aid of a special tool; a visual inspection must be made.

    - foreign materials such as detergent residue, dust particles, or human hair under the valve seat
    - cracks, tears, or distortion in valve materials
    - improper insertion of the valve body in the facepiece
    - cracks, breaks, or chips in the valve body that could cause leakage
    - missing or defective valve cover
    - improper installation of the valve in the valve body

- Examine inhalation valve for:

    - foreign materials such as detergent residue and dust particles
    - cracks, tears, or distortion in valve materials
    - improper insertion of the valve body in the facepiece (SCBA only)
    - cracks, breaks, or chips in the valve body and/or cartridge receptacle
    - missing or defective valves
    - improper installation of the valve in the valve body

7.6.3 Air Purifying Respirators

- Examine air-purifying respirators for:

    - correct cartridges, canister, or filters for the hazard
    - incorrect installation, loose connections, missing or worn gaskets and/or cross-threading in the holder
    - expired shelf-life date on the cartridge or canister

- cracks or dents in the outside case of the filters, cartridges, or canister indicated by the absence of sealing material, tape, foil, etc.

7.6.4 Respiratory Protection Devices with Corrugated Breathing Tube

- Examine the breathing tube for:
  - broken or missing end connectors
  - cross threading into facepiece
  - missing or loose hose clamps
  - deterioration, determined by stretching the tube and looking for cracks or holes
  - dirty, missing, or cracked gaskets

7.6.5 Respiratory Protection Devices Utilizing a Harness Assembly

- Examine harness assembly for:
  - excessive dirt
  - damage to the canister holder
  - broken harness straps for fastening
  - straps, clips - wear and in place
  - waist belt - wear, buckle functional
  - backplate
  - damage or defects
  - cylinder latch
  - holds cylinder tightly

7.6.6 SCBA Check Points

- Besides the items listed in the basic inspection procedures, the following will be inspected on SCBA:
  - <u>Regulator</u>
    - diaphragm cap - securely in place
    - pressure gauge - examine for damage
    - mainline and by-pass valves - functional with unit pressurized breathing tube connector - threads stripped or worn

- Audi-Larm

  - warning alarm - functional with unit pressurized
  - high-pressure hose - examine for cuts, severe abrasions
  - connector hand tight
  - "O" ring in place, dirt and wear

- Cylinder

  - hydrostatic test date - 5 years for steel
  - cylinder pressure (be sure cylinder is full prior to use)
  - body - cracks, dents, weakened areas
  - valves - examine for damage
  - gauge - examine for damage, fully charged
  - cylinders with less than 1800 psig will not be used for entry into a hazardous environment

- All respirators will be donned and leak tested by performing a negative or positive pressure fit-test.

7.6.7 Defects Found During Inspection

- If defects are found during any field inspection, two remedies are possible. If the defect is minor, repair and/or adjustment may be made on the spot. If defect is major, the device will be tagged and removed from service until it can be repaired.

- All major defective respirator devices will be turned over to the Safety Officer.

- Under no circumstances should a device that is known to be defective remain in the field.

- A tag or label will be attached to all defective devices. The date and defect will be noted, on the label or tag. The tag should read "DEFECTIVE - DO NOT USE."

- The Safety Officer will implement an inspection program for respirators and maintain written records of these inspections.

- The Safety Officer will periodically inspect individual respirators to verify the adequacy of cleaning and inspection.

7.7 Respirator Program Records

- All respirator program records and documents will be maintained by the Division Safety Officer with copies forwarded to the Corporate Health and Safety Officer.

- Inspection and maintenance forms will be maintained by the individual users. Copies of the forms will be promptly returned to the DivisionSafety Officer for retention in Division Health and Safety files.

7.7.1 User Training, Medical Clearance, Initial Fit Test Form 184

Each person using a respiratory device will be medically certified, trained, and qualitatively fit-tested for a specific form of respiratory device. The Safety Officer will record this data on Form 184 (see Figure 7-1).

7.7.2 Unit Issue Maintenance Log Form 284

- A log will be kept for all types of respiratory protection devices issued. and maintenance procedures will be performed on each device. Log will also serve as a respirator assignment sheet. The Safety Officer will record this data on Form 284 (see Figure 7-2).

7.7.3 Inspection of Units Forms 484 and 584

- SCBA and respirators used non-routinely will be inspected by the individual assigned to each unit for that particular task. Form 484 is to be obtained from the Safety Officer (see Figure 7-3).

- Routinely used respirators will be inspected before and after use. Inspection during cleaning is to be recorded on Form 584. Form 584 is to be obtained from the Safety Officer (see Figure 7-4).

7.7.4 Followup Fit-testing Form 384

- Qualitative fit-testing will be conducted every 6 months and be recorded on Form 384 (see Figure 7-5).

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FIGURE 7-2
UNIT ISSUE MAINTENANCE LOG - FORM 284
INITIAL FIT-TEST/ISSUE/MAINTENANCE LOG

Unit Type________________________ Unit Number__________

Issued to________________ of ___________ on ________

Initially Fit Tested on ____________ using ______________

Issued to________________ of ___________ on ________

Initially Fit Tested on ____________ using ______________

MAINTENANCE				
DATE	TYPE OF REPAIRS OR MAINTENANCE	PERFORMED BY	PARTS USED	LEAK TESTED

In service Date ______________ Removed from Service

RETURN TO DIVISION SAFETY OFFICER

FIGURE 7-3
MONTHLY INSPECTION - FORM 484

Unit No. ____________________ Serial No.__________________
Date_______________ Date Last Inspected_____________
Location________ Used by__________ Inspected by_______

Facepiece
Cleaned ___ Head harness ___ Inhalation valves ___
Lens ___ Exhalation valve ___ Speech diaphragm ___
Flexibility ___ Valve cover ___ Tightness of connections___
Nose cup ___ Cartridge receptacles ___ Leak tested ___

Type of air-purifying element__________________________
Expiration date________ Changed_________ Seals________

Breathing Tube
Cleaned___ Stretched ___ Gaskets ___

Harness Assembly
Cleaned ___ Straps, clips, buckle function ___
Backplate ___ Cylinder latch ___

Regulator
Diaphragm cap ___ By-pass valve ___ Hi-pressure hose ___
Pressure gauge ___ Connectors ___ "O" ring ___
Main-line valve ___ Audi-Larm ___ Connector hand-tight ___

Cylinder
Pressure_____ psig Valve___ Gauge___

Other
SCBA donned ___ Extra "O" rings ___ Instructions ___
Wrench ___ Carrying case clean ___ Spare cylinders ___

Comments______________________________________

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FIGURE 7-4
DAILY RESPIRATOR CLEANING & INSPECTION
(For use on projects where respirators are in active use)

DATE	UNIT NO.	CLEANED YES NO	CLEANED BY

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FIGURE 7-5
FIT-TEST LOG - FORM 384

Date___________

Nature of Hazard ____

____

Person Performing Qualitative Fit-test ____

____

NAME	UNIT NO.	QUALITATIVE METHOD USED	TIME	P/F	CORRECTIVE ACTION

RETURN TO DIVISION SAFETY OFFICER

7.8 Self-Contained Breathing Apparatus Training Program

- Units Used for Training: MSA Ultralite and 401 Pressure Demand Air Mask

- Selection of SCBA: The use of a pressure-demand SCBA may be necessary when it is determined that other forms of respiratory protection are inadequate. Also, an SCBA will be used when the type of airborne contaminant or concentration is unknown.

7.8.1 What is SCBA?

- Open circuit Self Contained Breathing Apparatus (SCBA) pressure-demand units.

- Pressure demand: A slight positive pressure is maintained in the facepiece at all times.

- Positive pressure reduces the likelihood of external contaminants entering into the facepiece, thus the lungs.

- Supplies Grade D breathing air, not oxygen, to user.

- Supplies the wearer with cool, noncontaminated breathing air.

- System is independent of atmosphere conditions.

- Provides the highest form of respiratory protection to user.

7.8.2 Limitations

- Protects only the respiratory tract from the toxic effects of contaminants.

- Protective clothing may be needed to prevent skin exposure which can result in contaminants reaching the blood.

- Weight of unit: Up to 35 pounds

- Units rated for up to 30 minutes of breathing time

- Communications

- Limited vision

- Freeze up in winter months.

- User may not receive 30 minutes. of breathing air because of excitability, fear, emotions, workload; physical conditions; training, or experience.

7.8.3 Use

- Emergency response

- Firefighting

- When the type of airborne contaminant or air concentration is unknown.

- Rescue

- IDLH environments caused by toxic air contaminants or oxygen-deficient environment containing less than 19.5% 0_2.

- The buddy system will be used in working in IDLH environments or when directed by supervisor.

7.8.4 Component Parts

- Cylinder: Contains a supply of compressed breathing air, cylinder gauge, and valve; 45 cubic feet at 2,216 psig. Never attempt to connect a 4500-psig cylinder to a 2,216 psig-apparatus. Use full cylinders only.

- Audi-Larm: Sounds a continuous loud warning at approximately 540 psig for about 6 minutes when equipped with a rated 30-minute 2,216-psig cylinder. Indicates low cylinder pressure.

- High pressure flexible hose: Routes the compressed air from the cylinder to regulator. The connection to the cylinder should be hand tight. Do not use a wrench. Contains an "O" ring that can be compressed.

- Regulator: Reduces high-pressure air from cylinder to breathable pressure and controls the flow of air to facepiece.

- Pressure demand regulator maintains positive pressure in facepiece during both inhalation and exhalation.

- Pressure gauge: Reads pressure remaining in system or cylinder.

- Mainline valve: Yellow round valve turns unit on so that air can enter the facepiece.

- Bypass valve: Red hexagon valve ensures that air can be delivered to the facepiece in the event of the regulator malfunctioning. Open only in an emergency involving regulator; open slowly.

- Breathing tube: Carries low-pressure air from regulator to facepiece.

- Facepiece assembly color code: Gold - large; black - medium; gray - small.

- Exhalation valve: Spring load. Never use the old style demand facepiece with a pressure-demand regulator. Exhalation valve will allow air to flow continuously out of facepiece.

- Inhalation valve

- Lens

- Head harness

- Speaking diaphragm: Aid in communications

- Nose cup: Used to prevent fogging

- Spectacle kit: Used for those who wear glasses and need corrective vision

7.8.5 SCBA Approval Limitations

- The interchange of parts from manufacturer's unit to another's will void the approval, except the interchanging of different manufacturers' cylinders with the same pressure rating is acceptable for firefighting operations.

- Respirator approval will, however, be voided when cylinders are exchanged.

7.8.6 Specifications/Check-list

- Regulator:

  - diaphragm cup - securely in place
  - pressure gauge - damaged/working
  - main-line and bypass valves functional with unit pressurized
  - breathing tube connector - threads stripped or worn

- Audi-Larm:

  - warning alarm functional with unit pressurized
  - high-pressure hose - cuts, severe abrasion, connector is hand tight
  - "O" ring in place, dirt and wear

- Cylinder:

  - gauge - damage, fully charged
  - valve - damage, leakage
  - cylinder pressure - 2,216 psig
  - hydrostatic test date - 5 years
  - body - cracks, dent, weakened areas

- Harness:
  - straps, clips - wear in place
  - waist belt - wear buckle function
  - backplate - damage or defects
  - cylinder latch - holds cylinder tight

- Nose Cup - Prevents fogging in cold weather by directing exhaled air out to exhalation valve.

7.8.7 Warnings

DO NOT USE SCBA WHEN:

- Cylinder is not full or leaking.
- Audi-Larms or gauges are not functioning.
- Parts are missing, dirty, or worn.
- Units are damaged.
- Units are questionable.

7.8.8 Maintenance and Inspection Qualifications

- All maintenance and inspections will be done according to MSA Bulletin No. 0105-62 "Inspection and Maintenance Procedures for the Ultralite Pressure Demand Air Mask."
- Only personnel holding a Level II certificate of instruction are permitted to perform maintenance or field repairs according to MSA Bulletin No. 0105-59 "Testing and Repair Procedures for Trained Air Mask Maintenance Personnel."
- Record all maintenance and inspections on the log sheet kept with the unit and in the logbook.
- Report all defective units to the supervisor
- Tag and mark all units found to be defective until repairs can be made.

7.8.9 Inspection Checkpoint - General

- Facepiece:
  - rubber - distortion, dirt, crack, tears, holes
  - harness - breaks, loss of elasticity, missing buckles and straps
  - lens - scratches, tight seal
  - exhalation valve - visual check for cleanliness

- breathing tube - cracks in corrugation, missing or loose hose connection, worn or discolored washers
- maintenance and inspection before and after use; monthly

7.8.10 Cleaning

- Wipe cleaning with a SaniCom pad or non-alcohol pad, outside surfaces cleaned first; inside surfaces wiped clean with a new pad. Clean lens with a fog-proofing agent following directions.

- Complete cleaning at the end of the work day;- follow MSA instructions in MSA Bulletin No. 0105-62 "Inspection and Maintenance Procedures for the Ultralite Pressure Demand Air Mask." Place clean mask in a clean plastic bag; seal and date bag. Alcohol will not be used as a germicide because it may deteriorate the rubber

7.8.11 Emergency Procedures

- Regulator malfunction:

  - Advise your partner.
  - Open bypass and regulate flow.
  - Move out of area to safety.

- Low-pressure alarm:

  - 540 psig or 6 minutes of air are remaining in tank.
  - Quickly go (do not run) to staging area for new tank.

- Leave area immediately if breathing becomes difficult, dizziness or other distress occurs, or you taste or smell contaminants.

7.8.12 General Limitations

- Facial hair - Facial hair in the form of beards, mustaches, sideburns, and stubble will not be permitted on employees required to wear respirators if the hair comes between the facepiece sealing surface and the face.

- Contact lenses - Will not be worn while wearing a respirator. Spectacle kits will be issued to those requiring corrective lenses.

- Sealing agents - Petroleum jelly, hand cream, powders, or any other agents placed on the face to achieve a face-to-facepiece seal will not be used to achieve a seal.

- Chewing of gum and tobacco is prohibited when using a respirator.

7.9 Pressure-Demand Airline Respirator with Egress Cylinder

This section covers the use of the MSA Hip-Air Breathing Apparatus and the dual purpose air mask by MSA.

7.9.1 What is an Airline Respirator?

- Supplied air respirator

- Supplies Grade D breathing air, not oxygen, to user

- Pressure demand: a slight positive pressure is maintained in the facepiece at all times

- Positive pressure reduces the likelihood of external contaminants entering into the facepiece and the respiratory system.

- Respirable air is supplied through a small-diameter hose that is connected to a compressor or compressed air cylinder(s). The hose is attached to the wearer's belt-mounted pressure regulator, and can be detached rapidly in an emergency.

- An egress cylinder - an auxiliary self-contained air supply on an airline respirator that allows the wearer to escape from a dangerous atmosphere. This device with auxiliary self-contained air supply is approved for escape, and may be used for entry when it contains at least a 15-minute auxiliary self-contained air supply.

7.9.2 Limitations

- Protects only the respiratory tract from the toxic effects of contaminants.
- Protective clothing may be needed to prevent skin exposure which can result in contaminants reaching the blood.
- Wearer is connected to an air supply hose which he must drag behind him. Hose is subject to kinks, snags, etc., and is heavy.
- Hose length cannot exceed 300 ft.
- Air-supply is external to user.
- Communications.
- Limited vision.
- Can freeze up in winter months.
- Air-line respirators provide no protection if the air supply is lost unless an egress cylinder is used.

7.9.3 Use

- Emergency response (allowed but SCBA preferred respiratory protection).
- When the type of airborne contaminant or air concentration is unknown, provided that an egress cylinder is used.
- IDLH environments or oxygen deficient environments containing less than 19.5% O_2 only when an egress cylinder is used.
- The buddy system will be used for work in IDLH environments, oxygen deficient environments, or when directed by Supervisor.

7.9.4 Special Provisions

When an air line respirator system is used, a standby person must be available to:

- Warn user that the low pressure alarm is activated.

- Warn user of any malfuncion in the air supply system.

- Warn user of any malfunction in the air supply system.

- Switch on tanks as needed.

- Observe inlet pressure test gauge or high pressure regulator gauges.

- Facilitate rescue. To facilitate rescue, standby person must be certified in the use of SCBA, and have a fully charged and functional SCBA unit nearby (within 10 feet).

- Standby person will be in radio contact with least two members of the user team.

- In case of communication failure, two tugs on the airline hose or the sounding of an alarm (horn or whistle) will signal all users to return to fresh air or to switch on egress tank and evacuate.

7.9.5 Component Parts

- Source of air

  - Compressed air cylinders or a compressor supplying Grade D air shall be used as a source of air.

  - The air shall be Grade D breathing air, or better. The air must meet OSHA, ANSI, and CGA requirements for compressed breathing air.

  - A certificate stating that the air is Grade D breathing air, or better. shall be obtained from the supplier of the compressed air. Compressor air shall be tested and certified as Grade D, or better, prior to initial use, after compressor repairs and prior to re-use, and periodically. The certificate must be kept on the job site.

  - Oxygen will <u>not</u> be used in the place of Grade D breathing air.

- Groups of compressed air cylinders may be used in series.

- All compressed air cylinders shall be chained or secured to prevent cylinders from falling.

- Cylinders must meet DOT specifications.

• Other Sources of air requirements

- Compressors: Before the airline respirator is connected to any type of air compressor, written specifications on the type of compressor to be used, filtering devices, CO alarms, etc. must be submitted to the Industrial Hygiene Department for approval.

- Airline respirators shall not be connected to any facilities in-house air supply or compressor.

• Low Pressure Alarm

- Sounds a continuous, loud, audible warning that the primary air supply has failed or is failing. Workers must exit the Work Area immediately.

• High Pressure Regulator

- High pressure regulators of the pre-set type may be used. The pressure should not exceed 85 psig, and the minimum pressure should not be less than 65 psig.

- The inlet pressure going to the air supply hose must be between 65 to 85 psig when using between 15 to 300 feet of air supply hose.

- When more than one air supply hose is used, a pressure gage shall be installed at the end of the manifold or between the manifold and air supply hose to ensure that at least 65 psig is being maintained in the system. The regulator shall be adjusted following manufacturer's instructions in order to maintain the pressure at the gauge between 65 and 85 psig.

- No air supply hoses will be directly connected to compressed air cylinders.

- Manifold

    - A manifold may be connected to the high pressure regulator to service one or more air supply hoses.

    - The manifold outlets shall be compatible to the supply air hose inlet. Supply air hose inlet fittings will not be compatible with other facility gas or vacuum systems.

7.9.6 Component Certification

- The following component parts are certified by NIOSH:

    - Air supply hose
    - Air supply hose fittings
    - Support belt: regulator
    - Breathing tube
    - Facepiece
    - Egress cylinder

- These components of an airline respirator shall not be altered or modified.

    - One manufacturer's components shall not be interchanged with another manufacurer's airline respirator components.

    - The maximum hose length is 300 feet, unless a lesser length is specified by the manufacturer, and the operating pressure range is between 65 and 85 psig.

- Air Supply Hose

    - Length of hose shall not exceed 300 feet

    - Construction of hose: Neoprene rubber, PVC

    - Coil hose in 50-foot lengths

- Hoses of different construction can be mixed as long as they do not exceed 300 feet in length, and are specified parts of the respirator system.

- Connection shall be of the thread type or of the quick connect locking type.

- Hose can be easily pinched or crushed, cutting off the air supply.

- Hose is subject to chemical attack, friction, and heat.

• Regulator - Pressure-Demand

  - Reduces high pressure air from air supply hose to breathable pressure and controls the flow of air to facepiece.

  - Pressure demand regulator maintains a slight positive pressure in facepiece during both inhalation and exhalation.

  - Connects egress cylinder to regulator.

  - High pressure hose.

• Egress Cylinder

  - Contains Grade D breathing air

  - Must contain at least 5 minutes of air to be considered an egress cylinder.

  - Shall be used in conjunction with the airline respirator at all times.

  - Shall be used for emergency egress only and not as a short-term SCBA.

• Belt/Harness

  - Holds egress cylinder and regulator in place

- Breathing Tube
  - Carries low pressure air from regulator to facepiece.
- Facepiece
  - Only full facepiece respirators will be used.
  - Color-code (MSA) gold-large, black-medium, grey-small.
- Exhalation Valve
  - Spring loaded
- Inhalation Valve
- Lens
- Head Harness
- Speaking Diaphragm
  - Aids in communication
- Nose Cup
  - To prevent fogging
- Spectacle Kit
  - For those who wear glasses and need corrective vision.

7.9.7 Inspection and Setup of Airline Respirator System

- Cylinders
  - Contain compressed breathing air
  - Free of damage corrosion, not leaking, DOT hydrostatic tested

- Valve is functioning, vents are clear, and threads are in good shape and free of dirt.

- Location of cylinder

  - Upright position and secured, keep bottom off the ground

  - Away from contaminated area, sources of heat, and heavily traveled areas

- Cylinder Connection

  - Open cylinder(s) valve slightly to blow out debris

  - Do not use pipe wrap or lubricants on the cylinder threads

- When using a cascade system to connect one or more cylinders together. Inspect the connecting hoses and couplings for cuts, dents, or other physical damage that may effect its performance. Do not use pipe wrap or lubricants on connections.

• Low Pressure Alarm

  - Connected to cylinder
  - Bell of the alarm is free of dirt and that clacker is not blocked by dirt
  - Alarm functional with system pressurized.

• High Pressure Regulator

  - Connected to low pressure alarm
  - Connection free of dirt and not damaged
  - Gauge connection
  - Gauge functional with system pressurized
  - Operating pressure 65 to 85 psig

• Manifold

  - Connected to high pressure regulator

- Connectors free of damage and clean
- Quick connections fit those on the female end of the air supply hose and are functional.

• Air Supply Hose

- Connect the desired length of hose(s) together
- Maximum length 300 ft.
- O-rings in place and not damaged
- Threads free of dirt and not crushed
- Sealing tape is not to be used on male threads
- Quick connects, functional, of the locking type , and approved by the manufacturer
- Duct tape will not be placed over connections
- Inspect Hose(s) for signs of damage to outer jacket, i.e., cracks, cuts, blisters, signs of chemical attack

• Egress Cylinder

- Gauge - damage, fully charged
- Valve - damage leakage
- Cylinder pressure
- Hydrostatic test date
- Body cracks, dents, weakened areas

- Regulator

  - Diaphragm cup securely in place

  - Pressure gauge damaged/working

  - Breathing tube connector - threads stripped or worn

  - Inlet side for air supply hose needle valve clean and free of dirt (male end). Female end of air supply hose compatible.

  - High-pressure hose - examine for cuts, severe abrasions, "O" ring in place, dirt, wear.

- Belt Harness

  - Straps, clips - wear in place

  - Waist belt - wear buckle function

  - Clean

- Breathing Tube

  - Broken or missing end connectors

  - Cross threading into facepiece

  - Deterioration, determined by stretching the tube and looking for cracks or holes

  - Dirty, missing, or cracked gaskets

- Facepiece

  - Inspect according to Section VI, Part B, of the respirator protection program

- Section VI, Parts A, B, and D through G shall also apply to the inspection procedure of the airline Respirator

WARNING

- DO NOT USE THE AIRLINE RESPIRATOR OR CONNECT TO HIGH PRESSURE CYLINDER IF:
  - Cylinder(s) do not contain Grade D breathing air
  - Low pressure alarm or gauges are not functioning
  - Egress cylinder is not full or functioning
  - Damaged air supply hose(s) or manifold
  - Missing, dirty, or worn parts
  - Operating pressure is not between 65 to 85 psig
  - Questionable units
  - System fails leak check after connection has been tightened
  - Hose(s) show signs of chemical attack

7.9.8 Leak Check Procedures

- All leak checks require that the airline respirator system be connected from the cylinder(s) to the facepiece(s) with the operating length(s) of supply hose laid out.
- Initial leak check: cylinder to manifold
  - Performed when system is first connected or cylinders are changed
  - Crack open cylinder(s) slowly and check all connect; from cylinder to manifold, using a soap bubble solution, e.g., "SNOOP"

- Tighten connections if leakage is found
- If tightening of connections does not stop the leakage, disassemble and inspect all components for damage
- Do not use system if leakage cannot be corrected

• Manifold to Airline Respirator Regulator

- Leak check must be performed when new supply air hose is added to the system.
- Pressurize line and check all connections from manifold to regulator using a soap bubble solution, e.g. "SNOOP".
- Tighten connections if leakage is found
- If tightening of connections does not stop leakage, disassemble and inspect all components for damage.
- Do no use system if leakage cannot be corrected

• Periodic Leak Check

- Done daily
- Pressurize systems, then turn system off at the cylinder
- Observe regulator gauges for 2 minutes. A drop of pressure is an indication of leakage.
- To isolate leakage, follow the initial leak check procedures.

• All inspections and leak test results will be recorded in the Field Supervisor's log book or standby person's log book.

NOTICE: For the Dual Purpose Air Mask, the inlet pressure shall be between 85 and 90 psig.

7.9.9 Flow Test Procedure Using Pressure Test Gauge

- The pressure being delivered shall be checked when two or more airline units are used.
- Test is made to ensure that between 65 to 85 psig of air is maintained at all times.
- Procedure:
  - Connect system as to be used
  - Attach inlet pressure gauge to manifold.
  - Attach all remaining air supply hoses to manifold.
  - Pressurize system; observe reading on inlet pressure test gauges. If not reading between 65 to 85 psig, adjust high pressure regulator until the desired pressure is read on the test gauge.

7.9.10 Donning of Airline Respirator

- After the air supply system and components of the airline respirator have been inspected, the unit is ready to don.
- Donning shall take place in a non-toxic atmosphere.
- Fit testing of the Facepiece will be done according to section IV, Parts A and B, of the respirator Protection Program.
- The egress cylinder is to be located on the right side of the body and the regulator is to be located on the left.

7.9.11 Care of Airline Respirator

- The airline respirator shall be maintained in accordance with Section V, Parts A through G of the Respirator Protection Program.

7.9.12 Cleaning of Air Supply Hose

- The air supply hose shall be cleaned daily.
- Solvents shall not be used to clean or decontaminate air supply hose.
- Air supply hose shall be broken down only after they have been cleaned. This will help to avoid any internal contamination of the air supply hose.
- Air supply hose will be inspected as cleaning proceeds.
  - Tag all damaged hoses.
- After the hose is broken down, the male and female ends will be wiped clean using a damp sponge or cloth.
- Hose is to be air dried.
- Never store or coil wet air supply hose.
- Protect all threads before storing.
- Store hose away from heat and direct sunlight.

7.9.13 Emergency Procedures - Use of Egress Cylinders

In the event that the primary air supply fails, the user shall:

- Open egress cylinder valve
- Disconnect regulator from primary air supply hose.
- Leave the dangerous atmosphere.

7.9.14 Basic Safety

- Don and remove facepiece in a non-toxic atmosphere.
- Hose length shall not exceed 300 feet.

- Operating pressure range shall be maintained between 65 and 85 psig.

- A standby person with SCBA will be in place when airline respirators are used.

- Cylinder(s) will be marked or tagged with the following information - full, in use, or empty.

- Air supply hose possesses a potential trip and fall hazard. Be alert.

- Egress cylinders will only be activated when the air supply is interrupted.

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APPENDIX 7-A

RESPIRATOR FIT TEST PROTOCOL

APPENDIX 7-A

RESPIRATOR FIT TEST PROTOCOL

A7.1 Introduction

The following Respirator Fit Test Protocol is adapted from OSHA 29 CFR 1910 and OSHA 29 CFR 1926 (revisions issued June 1986). The Isoamyl Acetate (IAA) and Irritant fume Procedures are described.

A7.2 Equipment

- MSA Ventilation Smoke Tube Assembly, MSA Part No. 5607.
- MSA Ventilation Smoke Tubes, MSA Part No. 5644.
- North Respirator Fit Test Ampules (0.5 cc isoamyl acetate each), North Part No. 7002.
- Three 1-liter jars with metal lids (e.g., Mason or Bell jars).
- Odor-free water (e.g., distilled or spring water) at approximately 254'1C.
- 100 cc graduated cylinder, or metric measuring cup. - 20 drops out of the 0.5 cc jar.
- Eyedropper.
- Mirror.
- Two fit test chambers similar to a clear 55 gal drum liner suspended inverted over a 2 foot diameter, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of each changer shall have a small clip so that the IAA ampules can be attached. One chamber is designated as the IAA chamber, and the other as the irritant fume chamber.
- A selection of respirators equipped with organic vapor and acid gas cartridges (MSA GMC-H or equivalent).

A7.3 Isoamyl Acetate (IAA) Procedure

A7.3.1 IAA Odor Threshold Screening

The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated.

All mixtures used in the screening test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

The Isoamyl Acetate (IAA) Stock Solution is prepared by adding two ampules (1 cc) of isoamyl acetate to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

The Odor Test Solution is prepared in a 1-liter jar by placing 0.4 cc of the IAA Stock Solution into 500 cc of odor free water using a clean eyedropper. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

A Test Blank is prepared in a 1-liter jar by adding 500 cc of odor free water.

The Odor Test Solution and test Blank jars shall be labeled 1 and 2 for jar identification . If the labels are put on the lids, they can be periodically peeled, dried off, and switched to maintain the integrity of the test.

The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2):

> The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle. one at a time, and sniff at the mount of the bottle. Indicate to the test conductor which bottle contains banana oil.

If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA Fit Test Procedure may not be used.

If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

A7.3.2 Respirator Selection

The test subject shall be allowed to pick the most comfortable respirator from a selection,. including respirators of various sizes, and, if applicable, different types from different manufacturers.

The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction does not constitute the subject's formal training on respirator use, as it is only a review.

The test subject should understand that he/she is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape and, if fit properly and used properly, will provide adequate protection.

The test subject holds each facepiece up to the face and eliminates those which obviously do not give a comfortable fit.

The most comfortable mask is donned and worn at least five minutes to assess comfort. All donning and adjustments of the facepiece shall be performed by the test subject without assistance from the test conductor or other person. Assistance in assessing comfort can be given by discussing the points below. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times, and to adjust the straps each time to become adept in setting proper tension on the straps.

Assessment of comfort shall include reviewing the following points with the test subject, and allowing the test subject adequate time to determine the comfort of the respirator.

- Positioning of mask on nose.
- Room for eye protection.
- Room to talk.

- Positioning mask on face and cheeks.

The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed.
- Strap tension.
- Fit across nose bridge.
- Distance from nose to chin.
- Tendency to slip.
- Self-observation in mirror.

The test subject shall conduct the conventional negative and positive pressure fit checks. Before conducting the negative or positive-pressure test, the subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down, while taking a few deep breaths.

The test subject is now ready for fit testing.

After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

A7.3.3 IAA Fit Test

Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges. The cartridges shall be changed at least weekly.

After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, to prevent general room contamination.

A copy of the Fit Test Exercises and the Rainbow Passage (A 7.7.2) shall be taped to the inside of the test chamber.

Three of the IAA ampules are broken and clipped to the top of the IAA chamber. They are replaced every 30-minutes.

Each test subject shall wear the respirator for at least 10 minutes before starting the fit test.

The subject enters the IAA chamber and performs the exercises described in A 7.7 for at least five minutes.

If at any time during the test, the subject detects the banana-like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

If the test is failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the procedure described above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

When a respirator is found that passes the test, the subject breaks the faceseal and takes a breath before exiting the chamber. This is to assure that the reason the test subject is not smelling the IAA is the good fit of the respirator facepiece seal, and not olfactory fatigue

At least two facepieces shall be selected for the IAA test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

If hair growth or apparel interfere with a satisfactory fit, they shall be altered or removed so as to eliminate interference. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as a powered air-purifying respirator, supplied-air respirator, or self-contained breathing apparatus.

If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

A7.4 Irritant Fume Procedure

A7.4.1 Respirator Selection

Respirators shall be selected as described in A7.3 above.

A7.4.2 Irritant Fume Fit Test

Irritant smoke can be irritating to the eyes. Thus, the irritant fume fit test procedure is not recommended for testing the fit of half masks, and should only be used to test the fit of full face respirators.

The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.

The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the fit test.

The test conductor shall review this protocol with the test subject before testing.

The test subject shall perform the conventional positive pressure and negative pressure fit checks. Failure of either check shall be cause to select an alternate respirator.

The test subject enters the irritant fume test chamber.

The test conductor shall direct the stream , of irritant smoke from the tube towards the faceseal area of the test subject. The person conducting the test shall begin with the tube at least 12 inches from the facepiece, and gradually move to within one inch, moving around the whole perimeter of the mask. This is most easily accomplished by inserting the tube through a hole in the chamber at about face level.

The test subject shall be instructed to do the exercises described in A 7.7 while being challenged by the smoke. The exercises shall be performed for at least five minutes.

The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

Each test subject passing the smoke test (i.e., without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response shall void the fit test.

The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as a powered air-purifying respirator, supplied-air respirator, or self-contained breathing apparatus.

If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

A7.5 Repeat of Fit Test

Because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

- Weight change of 20 pounds or more.
- Significant facial scarring in the area of the facepiece seal.
- Significant dental changes, i.e., multiple extractions without prothesis, or acquiring dentures.
- Reconstructive or cosmetic surgery.
- Any other condition that may interfere with facepiece sealing.

A7.6 Recordkeeping

A summary of all test results shall be maintained for 3 years. The Respirator Fit Test Worksheet (Form 384), or equivalent, shall be used.

A7.7 Fit Test Exercises and Rainbow Passage

A7.7.1 Fit Test Exercises

- Breathe normally.

- Breathe deeply. Be certain breaths are deep and regular.

- Turn head all the way from one side to the other. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders.

- Nod head up-and-down. Inhale when head is in the full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest.

- Talk aloud and slowly by reading the Rainbow Passage.

- Jog in place.

- Breathe normally.

A7.7.2 Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

8.0 PROTECTIVE CLOTHING PROGRAM

8.1 Levels of Protection

When field activities are conducted where atmospheric contamination or any other type of hazard is known or suspected to exist, personal protective equipment must be worn. Prior to the start of any field activities, the safety and health officer must designate a level of protection for that job. This designation will inform the field crew what hazards may be expected in the field and what personal protective equipment must be worn. The safety and health officer must use direct reading instruments (when available), such as the ENMET Tritector, the Foxboro Organic Vapor Analyzer, the HNU Total Organic Analyzer, or color detection tubes, whenever hazardous atmospheric contaminants are known to exist or are likely to be present. This information will help designate the level of respiratory protection required. Other information that should be investigated include material data sheets, chemical composition and properties of the known contaminants, DOT classifications, and other reference sources.

The following subsections outline the five levels of protection, the equipment required at each level, and the rationale for choosing each level. When there is insufficient information on the type of hazardous contaminants or their concentrations, the safety and health officer will assign Level A personal protective equipment until the pollutant concentrations and health effects are known.

8.1.1 Level A

Level A should be selected when the highest level of respiratory, skin, eye, and mucous membrane protection is needed. The personal protection equipment required at Level A includes

- Positive-pressure (pressure demand), self-contained breathing apparatus (MSHA/NIOSH approved)
- Fully-encapsulating, chemical-resistant suit (OSHA response suit)
- Gloves, inner, chemical resistant
- Boots, chemical resistant, steel toe and shank (depending on suit boot construction, worn over or under the suit boot)

- Underwear, cotton, long-john type (Optional)
- Socks, cotton
- Coveralls, cotton (undersuits) (Optional)
- Hard hat (under suit) (Optional)
- Nonsparking tools
- Explosion-proof lantern
- Two-way radio communications (intrinsically safe)
- Personal radiation detectors

8.1.2 Level B

Level B provides the highest level of respiratory protection, but a lesser level of skin and eye protection. The personal protection equipment required at Level B includes

- SCBA unit
- Chemical resistant clothing (neoprene splash suits or Saranex coveralls)
- Gloves, inner, chemical resistant
- Gloves, outer, chemical resistant
- Boots, chemical resistant, steel toe and shank
- Boots, outer, chemical resistant
- Socks, cotton
- Two-way radio
- Hard hat (Optional)

8.1.3 Level C

Level C protection should be selected when the type of airborne contaminant is known, its concentration has been measured, the criteria for using air purifying respirators have been met, and when skin and eye exposure is possible. Periodic air monitoring must be performed. The personal protection equipment required at Level C includes

- Full-face, air purifying respirator (MSHA/NIOSH approved)
- Chemical-resistant clothing (splash suit, Saranex, Tyvek)
- Gloves, outer, chemical resistant
- Boots, chemical resistant, steel toe and shank
- Boots, outer, chemical resistant (Optional)
- Cloth coveralls (inside chemical resistant clothing) (Optional)
- Two-way radio
- Hard hat (Optional)

8.1.4 Level D

Level D protection is designed for use when only skin and eye protection is needed and airborne contamination is unlikely. Personal equipment requirements for Level D include

- Hard hat (face shield)
- Goggles or safety glasses
- Gloves, chemical resistant (Optional)
- Work gloves
- Coveralls, long sleeve
- Ear protection (Optional)

- Dust respirator (Optional)

8.1.5 Level E

Level E is primarily a work uniform. It should not be assigned at any site where respirator or skin hazards exist. The minimal clothing to be worn on job site shall be steel-toe shoes, socks, long pants, and a long-sleeve shirt.

8.2 Chemical Protective Clothing

8.2.1 Scope

8.2.1.1 General

- The use of chemical protective clothing protects the worker from unwanted exposures when engineering controls are not feasible or are not being implemented.

- The safety of chemical protective clothing is limited by:

  - the nature of the hazard
  - unplanned work procedures
  - improper selection of chemical protective clothing
  - improper training in its use and care

- Types of protective clothing:

  - gloves
  - coveralls
  - boots and overshoes
  - topcoats
  - aprons and sleeves

8.2.1.2 The Need for Chemical Protective Clothing

- Some chemicals are considered to be carcinogens.

- Chemicals can accidentally be transported home on clothing, exposing those around you and contaminating furniture, rugs, or other clothing.

- Chemicals may be found in the following forms:

  - liquid
  - vapor or gas
  - powder or aerosol
  - as a contaminant in soil, water, and on objects

- Chemicals or contaminants can enter the body through the skin.

- Contact with chemicals or contaminants can pose a threat to the skin.

  - Chemicals absorbed through the skin can cause systemic poisoning and long-term health effects.

  - The skin will suffer a primary irritation such as a burn or rash due to extraction of essential oils from the skin.

  - The skin can become sensitized to the chemical or contaminant. Once sensitized the skin will react to smaller quantities of the substance that otherwise would have no effect on the skin.

8.3 Responsibilities

8.3.1 Safety Officer Responsibilities

- Hazard assessment to determine the types and concentrations of chemicals to which the skin may be exposed.

- Proper selection of chemical-protective clothing.

- Procurement and maintainance of chemical-protective clothing.

- Testing of chemical-protective clothing for degradation and permeation.

- Training workers in the use of chemical-protective clothing.

- Documentation and recordkeeping.

8.3.2 Field Supervisor Responsibilities

- Review of scope of the hazard and skin protection requirements with Safety Officer before start of a job.
- Monitoring of workplace and workers.
- Emergency selection of chemical protective clothing.
- Tailgate training sessions.
- Documentation of exposures on Form 214.
- Knowledge of Emergency First Aid.
- Assurance that individuals under their supervision are complying with rules governing the use of chemical-protective clothing.

8.3.3 Employee Responsibilities

- Compliance with all safety procedures and regulations governing the use of chemical-protective clothing.
- Insurance that the chemical-protective clothing used fits properly.
- Maintenance and inspection of clothing according to manufacturer's directions.
- Informing supervisor and division Health and Safety Officer of any actual exposure to hazardous chemicals.

8.4 Requirements for Use of Chemical Protective Clothing

Each person assigned a task that requires the use of chemical protective clothing must fulfill all requirements and follow all procedures as specified by this Chemical Protective Clothing Program.

8.4.1 Certification by Occupational Medical Consultant

- Not required at this time, unless worker is aware of a medical condition.

- Required if chemical is a carcinogen or required by OSHA regulations and standards.

8.4.2 Training Program

- Prior to being issued chemical-protective clothing, each employee will receive training in the use and limitations of such clothing. Training session will cover the following subjects:

  - concepts of proper fitting of clothing
  - proper cleaning and removal of clothing
  - inspection of clothing
  - nature and scope of hazard for which skin protection is required
  - corrective actions to be taken when clothing is accidentally torn
  - contents of this Chemical Protective Clothing Program

8.5 General Safety and Health Requirements

- Only protective clothing issued by the safety and health officer or field supervisor will be used.
- Limited use clothing will be properly discarded after use and not re-used.
- Clothing worn under protective clothing will be washed separately from other clothing or washables (e.g., towels, washcloths).
- Permission must be obtained from the safety and health officer or field supervisor before clothing worn under protective clothing, or clothing that may be contaminated, is washed at home.
- A supply of potable water, soap, and clean towels will be provided for wash-up when stationary supplies are not available. Waterless hand cleaner will not be used.

- Hands and forearms will be washed with soap and water after removing protective clothing.
- Smoking, eating, or drinking will be prohibited when wearing protective clothing.
- Personal effects (jewelry, watches, rings, etc.) will not be worn under protective clothing.
- Barrier creams will not be used for skin protection from chemicals.
- Conditions such as an open wound will be reported to the safety and health officer or field supervisor for evaluation before donning protective clothing.
- Protective clothing will be removed in areas designated by safety and health officer or field supervisor.
- Report all exposures or possible exposures (e.g., rip in glove, torn coveralls) to the safety and health officer or field supervisor.
- The minimal clothing to be worn by a worker on a job site will be steel toe footwear, socks, long pants, and a shirt.
- Failure to comply with this program will result in disciplinary action.

8.6 Selection of Chemical Protective Clothing

- Selecting the proper protective clothing begins with identifying the types of chemicals and their concentrations by using material data sheets, hazardous assessment sheets, monitoring instruments, and other pertinent information.
- Exposure levels to chemicals should be estimated by the nature of work to be done and chemical contact time.
- Select protective clothing by analyzing protective clothing requirements or on-the-job conditions.
- Consult the manufacturer's chemical performance guides for the proper protective clothing to be used for the chemical hazard. Select the material which offers the level of protection required for the chemical hazard and job.

- Protective clothing quality varies from one manufacturer to another based on quality control, thickness, and methods used to make protective clothing.

- Remember: There is no single material appropriate for protection from all hazardous chemicals. The protective clothing material most suitable for a specific application should be selected.

8.6.1 Common Terms Related to Chemical Protective Clothing Selection

- Cement and Latex refer to two basic manufacturing processes of unsupported liquid-proof gloves. As a general rule, cement dip gloves exhibit greater resistance to liquid and vapor permeation than do Latex dipped gloves. Therefore, where a permeation barrier is required, a cement dip glove should be selected.

- Permeation testing is the most important data obtained from chemical protective clothing data. Permeation or "breakthrough time" is the elapsed time between chemical contact with the material surface and its detection on the opposite side. Permeation testing data may be confounded by such variables as material thickness, mixture of solvents, manufacturing process and testing methods.

- Degradation refers to how long the material will last and is a reduction in physical strength of the material upon chemical contact.

Note: Even though a material may resist initial permeation by a substance, it may not provide protection for long-term or repeated use.

- When working with hazardous materials it is recommended that:

  - protective clothing be replaced frequently

  - protective clothing be changed immediately if overtly contaminated.

8.7 Gloves

- Since the hands are usually in the most intimate and prolonged contact with potentially harmful material, the permeability of gloves and the proper use of gloves are of considerable importance.

8.7.1 Pre-Use Inspection

- Make sure that the material of construction is that which was ordered or specified for the task.

- Visually inspect for defects such as deficient coatings, pinholes, and tears.

- Flex-stiffen gloves, and look for cracks and signs of shelf deterioration.

- Pinholes can be detected by blowing into the glove and then tightly rolling the gauntlet towards the fingers while determining whether the glove holds pressure.

8.7.2 Donning

- Never use previously worn gloves; chemicals can diffuse from outside of the glove to the inside over time.

- Use clean cotton glove liners (inner gloves) to absorb perspiration.

- Select a glove length long enough to provide splash protection and long enough to prevent solutions from entering the glove at the arm, if the hand is to be immersed.

- Select the proper size:

  - A glove that is too small will accelerate hand fatigue.

  - A glove that is too large may get caught or snagged on objects. Too large of a glove will decrease your dexterity.

- Over gloves should be worn over chemical-resistant gloves to prevent excessive wear, abrasion or tear, to the chemical-resistant glove (i.e., leather gloves for handling sharp objects or for a better grip on tools).

- When protective chemical coveralls are worn, place gloves under the sleeve, and tape the gloves at the wrist with duct or plastic tape.

8.7.3 In-Use Emergency and Procedures

- During the course of work, periodically inspect gloves for;
  - tears or punctures
  - evidence of chemical attack such as discoloration, swelling, stiffening, or softening.
- If any of the above are noted,
  - Exit the hazardous environment,
  - Properly remove glove in a safe area,
  - Discard the innerglove if it is wet or looks contaminated,
  - Wash hands with plenty of soap and water, and
  - Notify field superisor or safety and health officer

8.7.4 Removal

- Remove gloves in the designated safe area.
- Do not remove tight fitting gloves by pulling at the fingers.
- Remove gloves by grasping the cuffs and pull gloves off inside out.
- Discard and save inner gloves for washing.
- Wash hand thoroughly wit soap and water.

Note: Gloves do not supply electrical insulation and should not be used to handle live wires.

8.7.5 Storage

- Store gloves away from excessive heat and electrical equipment.

- Nondisposable Gloves shall be cleaned and inspected following manufacturer's recommendations.

8.7.6 Materials Information

Refer to individual manufacturers' permeability and degradation Guidance Manual.

8.8 Coveralls

8.8.1 Chemical Resistant Coveralls - Disposable

- Types of chemical resistant coveralls

  - Coveralls with collars

  - Coveralls with attached hoods and booties

  - Coveralls with only attached hoods

  - Coveralls with elastic arm and leg openings

8.8.2 Pre-Use Inspection

- Make certain that the material construction is that which was ordered or specified for the task.

- Visually inspect for

  - Uniform coating and thin spots,

  - Malfunctioning closures or draw strings, and

  - Tears and imperfect seams; pay close attention to the crotch area.

8.8.3 Donning

- Never re-use or launder disposable chemical-resistant coveralls.
- Use clean cotton coveralls when available under the disposable coverall to absorb perspiration.
- Disposal coveralls will not be worn without a second layer of inner clothing.
- Select the proper size:
  - Disposable coveralls that are too tight will bind in the crotch area and under the arms and thereby cause fatigue.
  - Disposable coveralls that are too large may get caught or snagged on objects, creating a physical injury hazard.
- When possible, workers should be seated when donning disposable coveralls.
- Use duct tape or ribbon to take up excessive slack.
- Clothing (rain suits, work coveralls, snow mobile suits) can be worn over the disposable coverall, but that clothing will be considered contaminated.
  - Over-clothing provides no chemical resistance and may absorb liquids.
  - Worker should be alert for tears in disposable coveralls.
  - Over-clothing adds to heat buildup, and workers should be aware of the signs of heat illness.
- Once on, all closures and openings should be secured and checked.
- Disposable coveralls with booties can be worn with a shoe on the inside or shoe boot etc. on the outside.
- The booties should never have prolonged contact with the walking surface.

8.8.4 In Use: Emergency Procedures

- During the course of the work task, periodically inspect disposable coveralls. Inspect for
    - Tears or punctures
    - Burns
    - Evidence of chemical attack such as discoloration
    - Swelling, stiffening, or softening
    - Liquid permeation
- If any of the above are noted, take the following actions:
    - Exit the hazardous environment.
    - Properly remove the disposable coverall in a safe area.
- If under clothing is wet or contaminated, place in a suitable container (i.e., plastic bag) for laundering and decontamination.
- Wash exposed area thoroughly with soap and water.
- Notify the Field Supervisor or Safety Officer.
- Small tears can be sealed with duct tape.

8.8.5 Removal

- Remove disposable coveralls in a safe area.
- Do not rip coveralls off. Use closures to open suit.
- When possible worker should be seated.
- Remove by pulling and rolling the disposable coverall inside out.
- Grab only the clean surface if gloves are not utilized.
- Discard. Place undergarments in suitable containers for laundering.

- Wash thoroughly with soap and water.

8.8.6 Emergency Donning

- When street clothing is worn under the disposable coveralls, the worker should empty pockets and leave valuables behind.

- Street clothing worn under disposable coveralls will be treated as contaminated and should be placed in a plastic bag until they can be laundered.

- Worker should maintain a change of clothing consisting of underclothing, socks, shoes, pants, and shirt plus a towel for emergency use.

8.8.7 Protective Envelope

- The protective envelope is used when a high degree of chemical protection is required from a chemical or hazardous material that may enter the body through the skin and respiratory system.

- The object of the protective envelope is to limit skin exposure and to protect the respiratory system.

- A protective envelope is not a fully encapsulated suit and should not be used in place of such suit.

- The protective envelope consists of:

    - A one piece Tyvek or Saranex suit (disposable coveralls) with attached booties and an open hood with drawstrings.

    - Gloves.

    - Full-face air purifying respirator or self contained breathing apparatus.

- Miscellaneous clothing needed:

    - Job issued underwear, t-shirt, socks and sneakers or shoes
    - Cotton coveralls
    - Glove liners

- Tyvek or Saranex hood
- Over shoes

8.8.7.1 Procedure

- Don all equipment according to written procedures.

- The donning process begins by the removal street clothing in a secure and clean area.

8.8.7.2 Donning Sequence

- Underclothing, socks, cotton coveralls, and shoes

- Disposable coveralls

- Respirator facepiece:

  - Place hood over respirator straps, and secure hood around respirator, or

  - Place respirator straps over hood and secure. When this method is used, an additional hood is needed if skin is exposed.

- Inspect facepiece hood enclosure making sure hair and skin is not exposed.

- Inner gloves.

- Gloves. Place gloves inside the sleeves of disposed coveralls, then secure glove at wrist with duct tape.

- Don SCBA.

- Inspect. Make sure skin exposure is limited and respirator fits properly.

- Don overshoes in contaminated area.

8.8.7.3 Entering Procedures

- Before entering contaminated area, record time in and the destination on Form 215 (see Appendix 8-A, Figure A8-1).

- Always work in pairs, or have radio communication with others.

8.8.7.4 Emergencies

- Follow written procedures and other directions.

- Have a roll of duct tape ready for emergency rips in gloves or disposal suit.

- Change an air cylinder in area designated by the Field Supervisor or Safety Officer.

- Know where the safe areas are located.

8.8.8 Removing Protective Envelope

- Outside surfaces of the protective envelope are considered to be contaminated. Steps must be taken to reduce the contamination levels before the protective envelope is open (i.e., washing or wet wiping of outside surfaces, HEPA vacuuming of outside surfaces).

- These surfaces should not be touched or handled with bare skin. Contact with the outside surface must be avoided at all times.

- The protective envelope will be removed in areas designated by the safety and health officer or field supervisor, and disposable items will be discarded in appropriate containers or bags.

- Nondisposable items will be decontaminated in the field prior to re-use.

8.8.8.1 Minimum Removal Requirements

- Removal Sequence

    1. Hard hat, overboots are removed.

2. Tape is removed from around joints.

3. Protective coveralls are removed.

4. Outer gloves are removed.

5. Respirator is removed.

6. Innergloves are removed after respirator is decontaminated.

7. Underclothing (nondisposable) is removed and placed in appropriate containers. Underclothing is not to be worn off-site until it is laundered.

8. Shower as soon as possible. If shower facilities are not available, wash hands, forearms, face, and all exposed areas with soap and water before leaving the site or eating, drinking, or smoking, if these activities are permitted.

8.8.9 Contaminant Reduction

- Contaminant reduction is a process that involves the systematic reduction of contamination as one travels from one area to another. In theory the procedure is designed to minimize environmental and personal contamination.

- Contaminant Reduction Zones (CRZ) are designated areas where various decontamination procedures are implemented and protective equipment is removed. The most simple of CRZ involves a semi-dirty zone, a semi-clean zone, and a clean zone (see Table 8-1). Zones can be separated by physical barriers (i.e., air locks) or by imaginary boundries. Each CRZ should be clearly marked.

TABLE 8-1

CONTAMINANT REDUCTION ZONES (CRZ)

Dirty	Semi-Dirty	Semi-Clean	Clean
<	CRZ 1	CRZ 3	CRZ 3
Hard Hats Overboots Removed	Protective Coveralls Removed	Respirator Innergloves Removed	Undergarments donned/doffed
	Outer gloves Removed	Respirator Cleaned P.P.E. donned	

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APPENDIX 8-A

ENTRANCE LOG AND EXPOSURE REPORT FORMS

Versar INC

FIGURE A8-1
Form 214
EXPOSURE REPORT

NAME ______________________ DATE __________

JOB SITE. LOC. ______________________

TIME OF EXPOSURE ______________________ SUPERVISOR __________

SUBSTANCE(S) EXPOSED TO ______________________

____

WAS SUBSTANCE IN: AIR ___ WATER ___ SOIL ___ OTHER ___

PROTECTIVE EQUIPMENT USED ______________________

____

CAUSE OF EXPOSURE ______________________

____

AREA OF BODY EXPOSED ______________________

ACTION TAKEN TO DECONTAMINATE ______________________

____

____

LIST CHANGES TO PREVENT EXPOSURE ______________________

____

____

______________________ __________
Supervisor Date

cc: Employee
Supervisor
Safety Officer
Physician

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TABLE A8-1
Form 215
ENTRY CONTROL SHEET

DATE ________________ JOB SITE ____________________

NAME	TIME IN	TIME DUE OUT	TANK PSI	LOCATION	TIME OUT	TOTAL TIME

9.0 PROTECTIVE EQUIPMENT PROGRAM

9.1 Introduction

Most field activities are conducted in areas that not only are hazardous because of exposure to atmospheric toxic contaminants, but where other safety hazards also exist.

9.2 Protective Equipment Program Elements

- Eye/face protection (Section 9.3)
- Head protection (hard hats) (Section 9.4)
- Foot protection (safety shoes) (Section 9.5)
- Safety belts and lanyards (Section 9.6)

9.3 Eye/Face Protection

Suitable eye and face-and-eye protective devices must be used where machines or operations present the hazards of flying objects, glare, and splashing of substances. All eye and face-and-eye protective devices must provide adequate protection against the particular hazards for which they are designed.

9.3.1 Minimum Requirements

- Eye and face-and-eye protectors must meet ANSI Standard Z87.1-1979.
- Protective devices should fit snugly without interfering with the movements or vision of the wearers.
- Protective devices should be durable and capable of being cleaned and disinfected.

9.3.2 Assignments Requiring Eye and Face-and-Eye Protective Devices.

- Eye protection is required at all times in the laboratory and manufacturing operations.

- Protective devices are required in situations where a hazardous or potential hazardous substance may come in contact with the eyes or face.

- Eye protection is required for all welding, cutting, or brazing operations.

- Protective devices are required when using striking, drilling, or cutting tools or any tool that poses a flying object hazard.

9.3.3 Selection

- Each eye or face-and-eye protective device is designed for a particular hazard. In selecting the proper device, consideration should be given to the kind and degree of hazard, and the device should be selected on that basis.

- Where a choice of protectors is given, and the degree of protection required is not an important issue, workers' comfort may be a deciding factor.

9.3.4 Types of Eye and Face-and-Eye Protectors

- Coverall goggles
    - Flexible fitting, with ventilation ports
    - Rigid body cushioned fitting
- Spectacles
    - Plano's or non-prescription
    - Prescription
- Faceshields/visors
    - Attached to safety headwear
    - Faceshield - with visor attached directly to the head
- Welders and chipper goggles and helmets

- Selection of welders and chipper goggles and helmets is based on the hazards associated with welding or cutting. Proper lens shade is important when selecting these devices.

• Special eye protection devices

- Special lenses (filter lenses) must be selected for use around infra-red and ultraviolet exposure sources.

- Tinted lenses will not be used as filter lenses unless the wavelength protection factor is known and is certified for viewing infra-red and ultraviolet sources.

• Coverall Goggles

- This form of protective device consists of a flexible body with ventilation parts, a lens, and an elastic head-strap.

- Goggles should form a seal around the eyes and aid in warding off splashes, dust, and vapors.

- Goggles worn over corrective spectacles should fit so that they fit without disturbing the adjustment of the spectacles.

- A special goggle hard hat/cap harness will be used to attach goggles to a hat or cap.

- Coverall goggles must be capable of being adjusted to fit the wearer's head snugly without cutting into the head or around the ears. The lenses should be capable of being replaced.

- Eye cup chipping goggles will be used when flying objects pose a hazard, or a coverall goggle with a rigid body can be used.

- If eyewear interferes with the fit of a half-facepiece respirator, a full-face respirator will be used.

- Nonprescription spectacles

  - Plano type with side shields

  - Only nonprescription spectacles with attached side shields will be used.

  - Nonprescription spectacles will not be worn under normal prescription spectacles.

  - Visitors' spectacles will not be used as a substitute for goggles or nonprescription protective eyewear.

  - Nonprescription spectacles should fit comfortably on the nose and not bite into the ears. Non adjustable models should be fitted by a specialist.

- Prescription Spectacles

  - Prescription spectacles will have attached sideshields.

  - Normal streetwear frames and lenses are not acceptable forms of eye protection, nor are normal streetwear frames with safety lenses acceptable.

  - Prescription lenses and frames must meet ANSI Standards for prescription industrial safety spectacles (ANSI Z-87).

  - Spectacles will be fitted by a vision specialist.

  - Photo-sensitive (gray) lenses will not be used.

- All sideshields will be the full-cup type frames. For comfort, they will be made of plastic or fiber.

- Faceshield

  - This form of protective device consists of a plastic shield that provides protection to the face and neck from chemical splashes and light impact.

Faceshields may fit directly on the head, slip over a hard hat via a special harness, or attach directly to a hat.

- Adequate eye protection will be used in conjunction with faceshields.

- As a minimum, an 8-inch faceshield will be used.

• Contact Lenses and Eye Protection

  - Contact lenses wearers must wear the normal protective eyewear required for the assignment.

  - Contact lenses will not be worn in conjunction with full face respirators.

  - Before entering an industrial site or hazardous waste site, check to see if contacts can be worn under normal protective eyewear.

9.3.5 First Aid

In conjunction with eye and face-and eye-protective devices, a means for flushing the eye and skin for at least 15 minutes will be provided. Workers will be trained in the use and location of such flushing devices.

9.3.6 Inspection and Maintenance of Eye and Face-and-Eye Protective Devices

• Inspect devices on a daily basis.

• Lenses should be inspected for scratches, pits, cleanliness, and proper seating in the frame.

• Frame or body should be inspected for flexibility, yellowing, cracks, and dirt vents should be kept opened. Sideshield should be attached and free of defect.

• Headbands should be inspected for slack, twists, or wear. Replace sweat-soaked or worn headbands.

• Inspect the suspension systems in faceshields attached directly to the head for wear, cracks, and defects.

- Replace all defective parts according to manufacturer's instructions.
- Replace lenses or parts with those made for that protective device.
- Never alter or modify a protective device.
- Prescription spectacles will be repaired by a vision specialist.
- A supply of replacement parts will be kept by the safety officer or supervisor.

9.3.7 Cleaning and Storage

- Eye and face-to-face protective devices will be cleaned and disinfected on a daily basis. Only cleaning agents recommended by the manufacturer will be used.
- A defogging agent may be applied to the lenses to prevent fogging.
- Keep lenses clean for better vision.
- Store spectacles in a crush-proof case, goggles in a plastic bag or speciai storage case, never on the hard hat.
- Remove faceshield when storing. Place it so it won't get scratched.

9.4 Head Protection

- Objectives: Group should be able to identify:
  - Reasons for head protection
  - Type of head protection/limitations
  - Inspection/functional parts
  - Fitting of head protection
  - Care of head protection.

- Reasons for Head Protection

  - Provides protection from impact and penetration from falling and flying objects, and from limited electric shock and burns.

  - Identification of user.

  - Head protection must be worn when doing overhead work or near overhead work, working on the street or highway, in confined spaces and trenches.

- Types of Head Protection and their Limitations

  - All head protection must meet ANSI Standard 289.1 and ISEA standards.

  - Class A, limited voltage resistance for general service.

  - Class B, high-voltage resistance.

  - Class C, no voltage protection

  - Class D, limited protection for firefighting

- Functional Parts/Inspection

  - Shell - before each use, inspect for cracks, signs of impact or rough treatment and wear.

  - Suspension - part of the cap, hat that gives it its impact distributing ability and absorbs the shock. Before each use, inspect for loose or torn cradle straps, broken sening lines, defective straps, missing sweatband, and cracked plastic. Suspension should be in each lug.

  - Chinstraps - inspect for elastic properties.

  - Damaged protective helmets will not be worn. Shell and suspension can be replaced.

- Remove parts from cap/hat, and show the group

- Fitting of Head Protection

  - Head protection will be worn on top of the head with brim pointing forward.

  - Suspension should be adjusted to fit the wearer and keep the hat a minimum distance of 1.25 inches above the wearer's head.

  - Hat/cap should be adjusted so that it will not fall off when bending forward and backwards.

  - Assign and fit individual for hat/cap.

- Care of Head Protection

  - Shell and suspension should be cleaned on a regular basis using an equipment wipe pad or an approved cleaner-sanitizer.

  - Never use a solvent to clean the shell or suspension.

  - The shell should never be painted.

  - Alterations of any sort will not be performed on the headgear. Use only manufacturer's replacement parts and accessories.

  - Store hats/caps in a clean, dry location away from direct heat.

  - Hats/caps should be used only for head protection and not be used for a tool, seat or ladder.

  - Follow all manufacturer's instructions for care, use, and limitations.

9.5 Foot Protection

- Foot Protection Requirements

  - Foot protection with steel toes must meet ANSI Z41.1 standards. Look for the ANSI identification on the inside of the footwear.

  - Select only footwear of good quality. Leather should be the material of choice.

  - As a minimum, a 6-inch or higher boot is suggested.

  - Remember that protective footwear will be worn for an extended period of time. Proper breaking-in time is important to prevent blisters.

  - Rubber, vinyl, or other foul-weather boots used in place of steel-toe foot protection must also meet the ANSI standard for protective footwear.

- Minimum Care

  - Footwear should be waterproofed regularly.

  - Over-the-shoe boots or "Tyvek" booties should be worn when contamination is likely.

  - Soles should be in good condition.

  - Inspect laces and leather on a regular basis.

  - Keep soles free of mud, sludge, and grit on a consistent basis.

  - Badly worn or damaged safety shoes must be replaced.

  - Check rubber or vinyl boots for cracks.

- General Safety Considerations

  - Shoe caps will not be accepted for safety footwear.

- Leather provides little protection from hazardous substances.

- If vinyl or rubber boots show signs of swelling, melting, or degrading, leave area immediately.

- Follow decontamination procedures for cleaning contaminated footwear.

- Protective footwear is required for all hazardous waste sites and plant visits.

- No stats are required to be worn when sparks of static electricity may cause a problem.

- Protective footwear should be worn when moving or lifting heavy objects or when there are chances for foot injury.

9.6 Occupational Protective Belts and Lanyards

9.6.1 Selection

- Occupational protective belts and lanyards shall meet ANSI A10.14.1975 standards that establish performance criteria for the construction and use of safety belt lanyards and lifeline.

- Each belt and lanyard assembly shall bear permanent identification marks which identify the manufacturer, date of manufacture, and the standard.

- Safety belt lanyard shall be a minimum of 1/2-inch nylon or equivalent with a maximum length to provide for a fall of no greater than 6 feet. The rope shall have a nominal breaking strength of 5,400 pounds.

- Belts may be made of any material except leather.

- D-rings, snap hooks, and buckles must be of drop-forged steel with a corrosion resistant coating. Surfaces shall be smooth, with no sharp edges.

- Hardware store rope and locally available mountainering snap hooks shall not be used on belts or for lifeline and lanyards.

- Before selecting protective belt and lanyards, consult with the manufacturer's representative.

9.6.2 Requirements

Belts and lanyards or lifeline system are required for:

- All aboveground work, when protection normally provided by guardrails may be absent or inadequate.
- Entrance into confined spaces.
- Work conditions that may result in serious injury if one should fall from an object or into an object.
- Working around impoundments, open tanks, etc.
- When fall protection is required.

9.6.3 Inspection Procedures

- Prior to each use, carefully inspect the belt and lanyard for indications of wear or deterioration. Always follow the manufacturer's inspection instructions.
- A written record of each inspection will be maintained.

9.6.4 Inspection Points on Belts

- Snaps - Should open and close freely. Any latches should be fully closed when engaged.
- Rivets - Check for tightness, especially those at the D-ring and D-ring wear pad.
- D-rings - Examine for evidence of nicks, cracks, distortion, or corrosion.
- Buckles - Should be checked for sharp edges, cracks, and corrosion. The tongue should overlap frame and move freely. Rollers should not be distorted in shape and roll freely. Friction buckles should be checked for distortion.
- Grommets - Check for pulled or lost and distorted grommets.
- Webbing - Stitching should be examined for breaks, burns, cuts or pulls, and chemical exposures. To visually check webbing conditions, hold the belt with your hands 6 to 8 inches apart. Bend the belt webbing in an inverted "U" fashion which will cause surface tension, exposing problem areas. Damage caused by corrosives, heat, or chemicals, will be readily apparent.

9.6.5 Inspection Points on Lanyards and Lifelines

- Rope - Should be inspected for abraded, broken, cut, or burned fibers, and for evidence of chemical or physical exposures. Splicing should be tight, and there should be no loose strands. To inspect lanyard material, rotate between the fingers, with the hands about 6 inches apart. Be sure to inspect the entire lanyard from end to end. Rope shall be free of knots.

- Snap Hook - Examine hook for distortions, cracks, corrosion, or pitted surfaces. The gate (latch) should seat into the nose without binding and should not be distorted or obstructed. The gate spring should exert sufficient force to firmly close the keeper. If the gate does not close, remove from service.

- Thimbles - Should fit snugly and be free of distortions, cracks, or sharp edges.

- CAUTION:

  - Look very carefully for any evidence that the material or assembly has been damaged and weakened.

  - Replace all worn or damaged items. Do not use the belt or lanyard until repairs have been made by the factory.

  - If evidence of excess wear, deterioration, or mechanical malfunction is observed, it is mandatory that the item be replaced or destroyed.

  - Should any of these items be subjected to actual loading or impact force, as developed in arresting a fall or otherwise, they must be removed from service and destroyed. The safety officer or supervisor shall be notified before any device is destroyed.

  - The belt and lanyard system will not be used as a climbing protection system.

9.6.6 Using the Belt and Lanyard System

- When the D-ring is used for fall protection, it should be located in the middle of the back.

- When the belt is to be used for positioning, two D-rings positioned at the user's side may be used.

- Belts will be worn snug and around the waist.

- Lanyards and lifeline shall be anchored to a firm point that could support a minimum of 5,400 pounds.

- Anchorage must be at least waist height to limit free-fall from lanyard system.

- Anchorage points must be independent of the work station .

- Hook-up and removal shall be made in such a manner that all fall is not possible.

- Anchorage for all lifeline or lanyard systems should be made using shackle, snap hook, or sling method of attachment. Knots will not be permitted.

- Lanyards should always be protected from the effects of cutting edges, contaminants, and abrasive material which may weaken the system.

- Do not rely on the feel or sound of snap hook engaging. Always check visually for proper engagement of the snap hook.

9.6.7 Safety Procedures

- Inspect belts, lanyards, or lifelines before using.

- Do not punch or cut extra holes in a belt.

- Never attach foreign objects to D-ring or between the body and belt.

- If a belt does not fit properly, replace it with one of the correct size.

- Wear belt snugly but not tight.

- Belts and lanyards must only be used as personal protective equipment.

- Lanyards should be as short as possible to minimize the fall distance.

- Never reduce the length of a lanyard or lifeline with a knot.

- Splices will only be made by a qualified splicer.

- Do not rely on the feel or sound of snap hook engaging. Always check visually for proper engagement of the snap hook.

- Do not use a defective or questionable belt or lanyard. Notify the safety officer or your supervisor of such conditions.

- Failure to follow the written directions contained in this program or manufacturer's directions may result in serious injury or death. Violations will result in appropriate disciplinary action

9.6.8 Cleaning and Storage

- Manufacturer's directions for cleaning belts and lanyards shall be followed.

- Inspect belts and lanyards while cleaning.

- Nylon and polyester webbing may be cleaned with a solution of detergent and water. Allow the equipment to dry thoroughly without using excessive heat.

- Store belt and lanyard in a clean, dry place, away from direct sunlight or chemicals.

9.6.9 Maintenance

- All replacement of worn or damaged items will be done by the factory. In most cases, it is more cost effective to destroy the item.
- Records shall be kept of all maintenance, including the in-service life of the belt and lanyard system.
- The service life of well-maintained ropes and webbing is 7 years maximum.

9.6.10 Emergencies

- When the belt and lanyard system is used, a pre-plan rescue procedure shall be established in the event that a person may fall or become trapped.

9.6.11 Training

- All employees required to use the belt and lanyard/lifeline system will receive hands-on training in the care, use, and limitations of the belt and lanyard system.
- Employees should be knowledgeable of information contained on the sheets regarding occupational protective belts and lanyards.
- Training will be documents.
- Before a job begins and when belts and lanyards are to be used, safety procedures will be reviewed.

APPENDIX B

VERSAR'S CONFINED SPACE ENTRY PROGRAM

16.0 CONFINED SPACE

16.1 Introduction

A confined space is defined as any space having limited means of entry or exit and enclosed such that adequate natural and mechanical ventilation is not obtainable. Confined spaces are subject to accumulations of toxic or combustible agents and to oxygen deficiency. Confined spaces may include, but are not limited to storage tanks, open topped spaces of more than four feet in depth, ventilation ducts, man-holes, sewers, tunnels, ovens, furnaces, and other similar structures. All confined spaces shall be considered dangerous to health and life until proven otherwise.

16.2 Safety Measures for Working in Confined Spaces

16.2.1 Confined Space Entry

- No confined space shall be entered without written permission from the project health and safety officer.
- Written permission to enter a confined space is valid only for one day.
- The notice of written permission shall be attached to a health and safety checklist for confined spaces and displayed at the entry of the confined space.
- Failure to issue or request written permission will result in disciplinary action.
- An entry and exit log shall be maintained in conjunction with the confined space checklist.

16.2.2 Isolation of Confined Spaces

- Efforts shall be taken to prevent accidental release of any liquid, gas, vapor, or steam into a space while work is taking place.
- All steam lines shall be locked out with padlocks by workers entering a confined space. The lock-out will be such that those workers in the confined space will have the only means to remove the lock-out.

- A red warning tag will be used in conjunction with the lock-out. The red tag shall not be the sole means of lock-out.

- Where practical, a cut and cap procedure shall be used to disable lines carrying harmful agents.

- All electrical systems shall be locked out using padlocks to prevent accidental re-energizing.

- Barriers and asbestos warning signs shall be erected where applicable.

16.2.3 Checking Air Quality In Confined Spaces

- Gases or vapors, whether toxic or not, can accumulate in confined spaces and may displace the necessary concentrations of oxygen; therefore, no confined space entry will take place until the atmosphere of confined spaces has been assessed and found or rendered safe.

- Entry into any sanitary sewer shall require a check for combustible gases near the cover prior to its removal. No removal of the cover shall be attempted unless combustible gas levels are less than 20% of the lower explosive limit (LEL).

- In assessing confined space atmospheres, primary concern should be placed on oxygen levels which must be at least 19.5%.

- Secondary assessments should entail combustible gases. Levels greater than 20% of the LEL shall be considered hazardous and must be eliminated before entry.

- Finally, assessments should be directed towards toxic gases.

16.3 Ventilation Requirements

Ventilation of confined spaces is required under the following conditions:

- Oxygen less than 19.5%
- Combustible gas greater than 20% of the LEL
- Hydrogen sulfide greater than 10 ppm

- Whenever organic solvents will be used
- Whenever open flame will be used
- If any organic vapor is suspected
- If any toxic or other hazardous material is suspected
- When the entry is in an area of vehicular travel

Ventilation shall be carefully designed not to reintroduce exhaust gases into the ventilated area.

16.4 Emergency Procedures

Emergency procedures shall follow those outlined in Versar's Emergency Procedures Program.

16.4.1 Lighting

- Temporary lights will be provided with guards to prevent accidental contact.
- Temporary power shall be properly ground fault protected.
- Lighting may not be suspended by electrical cords.
- Electric lighting used in extremely moist or hazardous locations shall be of a 12 volt or less power source.

16.4.2 Ladders

- Ladders shall be used to entry depths of four (4) feet or more. Ladders shall extend at least three (3) feet out of the entry.

16.4.3 Monitoring During Work

- Atmospheres shall be monitored continuously while work is being performed.
- Monitors will include audible alarms for preset levels.
- Workers will vacate the waste area immediately if an alarm is activated.

16.4.4 Hot Work

- Hot work such as cutting with torches will require special considerations.
- Continuous ventilation will be required for all hot work.
- All oxy-acetelene tanks will be located outside of the confined space.

16.4.5 Use of Paints or Solvents

- Continuous ventilation is required.

- Proper respirator protection shall be used as outlined in Versar's Respiratory Protection Program.

16.4.6 Noise

- Existing or possible noise problems will be assessed.

- Protective devices shall be issued if deemed necessary or if requested by workers.

16.4.7 Communications

- Special communications devices shall be used if visual or audible communications are limited by conditions in the confined space.

- Workers shall use a buddy system and communications maintained at least every 2-3 minutes, unless there is continuous visual contact.

16.4.8 Respirator Protection

- Respiratory protection shall be used in compliance with Versar's Respiratory Protection Program.

16.4.9 Responsibilities

- Safety and Health Offices

  - Implement and enforce confined space safety program.
  - Conduct training for supervisors and workers on confined space safety.

- Monitor confined spaces for possible hazards.
- Recommend proper requirements for specific case confined spaces.
- Provide written permission and confined space safety checklists as needed.
- Recommend disciplinary action for infractions of the confined space safety program.

• Field Supervisor's Responsibilities

- Conduct tailgate meetings on confined space safety.
- Ensure adequate assessment of confined space atmospheres.
- Ensure proper respiratory protection is used.
- Ensure continued monitoring of atmosphere and alarm calibrations.
- Ensure proper ventilation is implemented as needed.
- Ensure lock-out procedures are followed.
- Ensure electrical safety guidelines are followed.
- Ensure communications are adequate for specific case confined spaces.
- Ensure workers entering confined spaces are familiar with safety requirements.
- Report infractions of confined space programs to Safety Officer.
- Ensure proper entry and exit procedures used.
- Ensure employees sign in and out of confined space log.

• Employees

- Review confined space program.
- Request confined space entry permission before entering any confined space.
- Ensure proper assessment of atmosphere has been accomplished prior to entry.
- Sign in and out on confined space log.
- Use required respiratory protection equipment.
- Follow all confined space program guidelines.
- Maintain required communications.
- Exit immediately the confined space if monitoring alarms sound.
- Report any suspicious odors to supervisor.
- Report any infractions of confined space program to supervisor.

16.5 Confined Spaces/Potentially Explosive or Flammable Sites

A confined or enclosed space means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to:

- Utility manholes, vaults, sewers
- Attics, subcellars, sump pits, excavations
- Silos
- Ventilation of exhaust ducts
- Storage tanks, process vessels
- Open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels
- Mine tunnels

Prior to the initiation of field activities, hazardous materials should be isolated and electrical equipment should have the power disconnected. If the responsible agency or client has a confined area entry permit, it must be filled out by the field supervisor. If such a sheet is not provided, the project manager shall notify the client in writing of the location, date, and time entry will be made.

Direct reading instruments which detect combustible gases and vapor, total organic gases, and the sufficiency of the oxygen level must be used prior to entering a confined space or an area with a potentially explosive or flammable environment.

The hazards associated with confined spaces and potentially explosive or flammable environments are:

- Oxygen deficiency - atmospheres containing less than 19.5% oxygen.
- Combustible gases and vapor - atmospheres which may explode or ignite if a source of ignition is present in or introduced into the environment, such as:

- Vapors of gasoline, kerosene, solvents, and other hydrocarbons
- Methane (sewer, marsh, and natural gases)
- Carbon monoxide
- Hydrogen sulfide

• Toxic gases and vapors - atmospheric contaminants that even in low concentrations can cause serious injury or death. This includes asphyxiants and irritants such as, but not limited to:

  - Carbon monoxide
  - Carbon dioxide
  - Nitrogen dioxide
  - Methane
  - Hydrogen sulfide
  - Sulfur dioxide
  - Hydrogen cyanide

The following safety practices should be followed when entering a confined space of a potentially explosive or flammable environment.

• All confined spaces shall be considered oxygen deficient and contaminated by hazardous gases and vapors unless proven safe by air monitoring

  - Preentry Test:

    -- Made with manhole cover or door in place if possible (i.e., when cover or door contains vents)

    -- When manhole cover is unvented it should be opened enough to admit the test hose of the instrument to enter on the downwind side. If tests indicate hazardous gases, care shall be taken when removing the cover to avoid creating sparks.

• Smoking is prohibited in or within 10 feet of manholes or confined spaces.

• Every individual entering a confined work area shall be properly trained in the procedures for entering, detecting hazardous conditions, and rescue.

- Forced ventilation shall be used to purge the confined space of combustible or toxic gases and vapors until safe levels are established.

- When initial tests indicate that the atmospheres is safe, the field supervisor will determine if force ventilation is needed.

- The field supervisor is responsible for monitoring the confined space atmosphere while work is progressing.

- Emergency escape air mask may be utilized.

- Confined space entrance shall be made wearing a harness with lifeline arrangement. If such a device interferes with the work, the field supervisor may have the lifeline removed from the harness. The lifeline must remain within 3 feet of the person in the confined space.

- At least one man shall be standing by at the entrance, equipped and capable of removing the worker in an emergency.

When the confined space has been found to have an oxygen deficient or toxic atmosphere, the following safety precautions must be taken.

- Personal protection Level A will be assigned by the field supervisor.

- Positive-pressure (pressure demand) self-contained breathing apparatus shall be worn.

- Forced ventilation shall be established and maintained.

- Lifeline and harness arrangement shall be utilized to facilitate rescue.

- The field supervisor shall appoint a safety monitor who is trained in the use of SCBA, first aid, mouth-to-mouth resuscitation, and emergency rescue, to be stationed at the access opening of a confined space.

- The safety monitor shall be equipped with a self-contained breathing apparatus (positive-pressure) and be instructed to enter the confined space only if the lifting of the worker with the harness and lifeline is impossible.

- The safety monitor shall have available emergency telephone numbers and a method of communication.

- The universal rescue tripod or block and tackle systems shall be utilized around manholes or tanks.

APPENDIX C

HOT WORK PERMIT AND EQUIPMENT INSPECTION LOG

HOT PERMIT

COMPLETED PERMIT MUST BE POSTED AT THE ENTRY OR WORK SITE

LOCATION	ISSUED BY	DATE	TIME (FROM) ☐ AM ☐ PM	(TO) ☐ AM ☐ PM
ACCEPTED BY		COMPANY/CONTRACTOR		

AN ALERT, GAS RELEASE, EVACUATION, INTERRUPTION OF 8 HOURS OR MORE OR CHANGE IN WORKING CONDITIONS SUSPENDS THIS PERMIT (Permit must be reissued or reauthorized)

SECTION 1 — GENERAL AREA WORK PERMIT

1. WORK LIMITED TO THE FOLLOWING (DESCRIPTION & AREA/EQUIPMENT)

2. SPECIAL HAZARDS TO PROTECT AGAINST ☐ NONE — MSDS AVAILABLE ☐ YES ☐ NO ☐ N/A

Chemicals (name)

						ENERGY TYPE(S)
☐ Flammable	☐ Noise	☐ Hot Water/Seam	☐ Thermal Burn	☐ Falls	☐ Pinch Pts./Srp. Edges	☐ Electrical ___ volts
☐ Toxic	☐ Corrosive	☐ Heat Stress	☐ Elect/High Vltg Line	☐ Asbestos	☐ Other________	☐ Hydrau/Pneu __psig
☐ Skin Contact	☐ Reactive	☐ High Pressure	☐ Inert Atmosphere	☐ Radiation	________	☐ Other (magnitude)___

3. SAFETY EQUIPMENT (OTHER THAN AREA REQUIREMENTS)

☐ Leather Boots	☐ Face Shield	☐ Ground Fault Circuit Int	☐ Supplied Air	☐ Long Sleeves
☐ Leather Gloves	☐ Hood	☐ Barricades/Warning Signs	☐ Respirator	☐ Other________
☐ Hearing Protection	☐ Fall Restraint Device	☐ Communications Equip (list)	☐ Fire Resistant Clothing	________

4. THE PERSON RECEIVING THE PERMIT VERIFIES THAT ALL WORKERS

A. Have been through the Safety Orientation	☐ Yes	F. Know emergency alarms, evacuation, assembly points	☐ Yes
B. Understand applicable HAZCOM Requirements	☐ Yes	G. Know the procedures for Safe Job Completion	☐ Yes
C. Have discussed hazards of the job and area	☐ Yes	H. Have inspected all tools/equipments/scaffolding	☐ Yes
D. Know the location/use of safety showers/eye wash stations	☐ Yes	I. Understand the Housekeeping requirements	☐ Yes
E. Know the location of the phone or intercom	☐ Yes	Permit Receiver Initials	

5. POTENTIALLY AFFECTED AREA PERSONNEL AND WORKERS NOTIFIED OF WORK TO BE DONE ☐ Yes ☐ N/A

6. THE FOLLOWING RESPONSIBILIES HAVE BEEN COMMUNICATED TO THE PERSON RECEIVING THIS PERMIT

☐ Conditions for Work Stoppage	☐ Performing the Work Safety	☐ Completion of Section 8 and Permit Return
☐ Crew Accountability	☐ Reporting Changes That Affect Job Safety	

SECTION 2 — AIR TESTS

PRIOR TO HOT WORK	1. Oxygen meter test performed ☐ Yes ☐ N/A	Reading $\%O_2$	Range 19.5-23.5% O_2	Tested By	Location of Test	Time ☐ AM ☐ PM
	2. Combustible gases and vapors test ☐ Yes ☐ N/A	Reading %LEL	Maximum 10% LEL	Tested By	Location of Test	Time ☐ AM ☐ PM
☐ DOES NOT APPLY	3. Test for toxics (substance) ☐ Yes ☐ N/A	Reading ☐ PPM ☐ mg/M^3	PEL/TV ☐ PPM ☐ mg/M^3	Tested By	Location of Test	Time ☐ AM ☐ PM

SECTION 3 — OBSERVATION & RESCUE

1. ☐ Yes ☐ N/A	Continuous monitoring for ________ (Substance)	Tested By	Time (from) ☐ AM ☐ PM	Time (to) ☐ AM ☐ PM
2. ☐ Yes ☐ N/A	Periodic tests for ________ (Substance)	Tested By	Time (from) ☐ AM ☐ PM	Time (to) ☐ AM ☐ PM
☐ Duration of work ☐ Personal	☐ Area ☐ Other ________			
3. ☐ Yes ☐ N/A	Fire/Safety Attendants	Designated Person(s)	How to Contract	
4. ☐ Yes ☐ N/A	Special rescue service/equip required	Location of Special Equipment	Rescue Service Phone Number	

SECTION 4	HOT WORK			YES	N/A		YES	N/A
			1. Fire Extinguisher (type) _______ Is it full?			8. Ground lead attached to work		
			2. Survey area for combustibles & openings/holes/trenches, etc.			9. Prevention of heat exposure to gasket/seal/liners		
			3. Combustible Materials removed or protected			10. Other work in area which should be stopped		
			4. Heat/spark control- tarps, covers, water, etc.			11. Material present which emits vapor when heated		
			5.Precaution taken for hidden combustibles			12. Radiant heat transfer considered		
			6. Purge gas used. Type ______________________			13. Equipment operating or contains original contents		
			7. Adjacent area safe/sewers protected			14. Ducts or conveyors plugged or protected		

SECTION 5	ENERGY LOCKED/ TAGGED			YES	N/A		YES	N/A
			1. Line positively identified			9. Are all automatic valves secured in a safe position		
			2. Line/equip drained/depressurized, piping properly supported			10. Electrical panel switches locked, tagged and labeled		
			3. Line/equipment cleaned and purged			11. Field switches tested		
			4. Blinds and/or block and bleed in place			12. Fuses removed/switches open		
			5. Lock(s) required (list lockout points)			13. Are belts/couplings removed?		
			6. Splash guards considered			14. Are rotating parts blocked?		
			7. Adjacent area safe. (If limited, describe below)			COMMENTS		
		☐ DOES NOT APPLY	8. Area roped/taped off					

OBSERVERS, WATCHERS, RESCUERS

I have been instructed as confined space attendant/fire safety watcher or backup rescuer and understand my duties.

SIGNATURE	DATE	SIGNATURE	DATE
		(	

PERSONS AUTHORIZED TO PERFORM WORK AND/OR TO ENTER CONFINED SPACE

I have been instructed in and am aware of the possible hazards and conditions I may encounter in this entry work.

SIGNATURE	TIME IN	TIME OUT	DATE	SIGNATURE	TIME IN	TIME OUT	DATE

COMMENTS	

SECTION 6			YES	NO	N/A		YES	NO	N/A
	Questions to be Completed on Permit Expiration or Job Completion	1. Has the job been completed?				5. Have safety devices been reinstalled?			
		2. Has the area been cleaned of work materials?				6. Has hot work area been surveyed for smoldering materials			
	Worker Closeout Signature	3. Have dept. personnel been informed job is done?				7. Special precautions, concerns, or remarks?			
	Time ☐ AM ☐ PM	4. Have all locks and/or tags been removed?				COMMENTS			

DAILY EQUIPMENT INSPECTION FORM

Date ____________ Type ________________ Equipment No. ______________
Inspector ______________________________ Model No. ________________

(The Following Items Must Be Checked As Applicable, If Not Applicable, So Indicate)

Item	Yes	No	N/A	Date Corrected/Comments
Records				
1. Is manufacturer's data available?				
2. Are maintenance and inspection records available?				
3. Proof of Insurance Form?				
4. Vehicle Registration or Lease Agreement?				
Cab/Operator's Station				
1. Is a fire extinguisher provided?				
2. Are tools and equipment secured?				
3. Are seatbelts provided?				
4. Emergency flares or triangles?				
5. Spare tire/jack/lug wrench?				
6. First Aid Kit?				
Safety System Check				
1. Headlights operational?				
2. Taillights operational?				
3. Brakelights operational?				
4. Turn signals operational?				
5. Horn operational?				
6. Backup alarm functioning?				
7. Brakes in proper working order?				
8. Emergency brake operational?				
9. Wipers blades functional and good repair?				
10. Tires not showing excessive wear?				
11. Defroster functional?				

(The Following Items Must Be Checked As Applicable, If Not Applicable, So Indicate)				
Item	Yes	No	N/A	Date Corrected/Comments
Adding/Lubricant Levels				
1. Engine oil level full?				
2. Oil pressure gauge operational?				
3. Radiation coolant level full?				
4. Water temperature gauge operational?				
5. Hydraulic oil level full?				
Operational/Mechanical				
1. Lifting cables in good repair?				
2. Lift & lower bucket/blade operational?				
3. Forward/backward tilt of bucket/blade operational?				
4. Are exposed moving parts guarded?				
5. Hydraulic systems in good repair?				
6. Audible alarm for bi-directional equipment functional in both directions?				
7. Coupling device functional?				
8. Clutch in proper adjustment?				
9. Transmission functional in all gears?				
10. Exhaust system free of leaks?				
11. Tracks in good repair?				

COMMENTS: ____

____

____

____

____

______________________________ ______________________________

Inspector's Signature Date

APPENDIX D

DAILY HEALTH AND SAFETY REPORT FORM

Versar INC.

DAILY HEALTH & SAFETY REPORT
ENVIRO-CHEM, ZIONSVILLE, INDIANA

Daily Report No. ______________________ Date: ______________________

SUMMARY OF DAILY SAFETY BRIEFING:

1. List Site Activities to be Performed Today:

____
____
____
____
____

2. Briefly Describe Any Special Chemical/Physical Hazards Discussed Associated with Today's Activities, Including PPE Levels for these Activities:

____
____
____
____

3. List Any Special Health & Safety Issues Discussed:

____
____
____
____
____

4. List of Attendees:

Printed Name	**Signature**

Versar INC.

SUMMARY OF DAILY SITE ACTIVITIES AND HEALTH & SAFETY ISSUES

1. Briefly Describe Environmental/Weather Conditions (i.e., temperature, precipitation, cloud cover, wind speed, wind direction, etc.):

____
____
____
____

2. Briefly Summarize Site Operations:

____
____
____
____
____
____
____

3. Summarize Daily Site Worker Activities:

Worker Name	Operation(s) Performed	Time Spent on Each Operation	PPE Used for Each Operation

Versar INC.

4. Summarize Daily Health & Safety Monitoring Activities:

Operation(s) Performed	Monitoring Equipment Used	Range (Max-Min) for Each Monitor	Average Reading for Each Monitor

5. Provide a Summary of Site Visitors (attach site visitor log and note areas/operations observed, PPE used, training/medical release status for each visitor):

Visitor Name	Areas/Operations Observed	PPE Used	Training/Medical Release Status

6. Provide General Observations Regarding Health and Safety for Each Operation:

7. Summarize Health and Safety Problems Encountered:

8. Describe Resolutions to Health and Safety Problems Noted Above:

9. Briefly Describe Any Health and Safety Decisions Reached and Their Rationale:

10. Other Comments:

Versar's Verification: On behalf of Versar, I certify this report is complete and correct, and all activities performed during this reporting period are in compliance with the contract plans, specifications, health and safety plan, and applicable federal and state regulations, to the best of my knowledge, except as may be noted above.

Site Health and Safety Officer

ADDENDUM NO. 1 VERSAR'S HEALTH AND SAFETY PLAN

REVISED REMEDIAL ACTION
HOT SPOT WORK PLAN
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

PREPARED FOR:
ENVIRONMENTAL CONSERVATION AND
CHEMICAL CORPORATION SITE TRUST FUND

VERSAR PROJECT NUMBER 3709

MARCH 1998

1.0 INTRODUCTION

1.1 Background

This Addendum to Versar's Health and Safety Plan (HSP) has been developed for the "hot spot" treatment activities to be conducted at the Environmental Conservation and Chemical Corporation (ECC or Enviro-Chem) Site, located in Zionsville, Indiana. A "hot spot" of concentrated organics was noted in the area of the Southern Concrete Pad during the geotechnical evaluation of this area. Consequently, Versar developed a *Hot Spot Work Plan* to address this issue. This addendum to the HSP contains the procedures that are necessary to protect on-site personnel during this phase of work. All Versar/Handex personnel, as well as subcontractors and visitors to the site, will be required to abide by all of the requirements of this addendum. This Addendum is not a stand alone document and must be used in conjunction with the detailed procedures included in Versar's Health and Safety Plan, Revision 2, dated February 1998.

1.2 Scope of Activities

A detailed scope-of-work for the "Hot Spot" treatment is included in Versar's *Hot Spot Work Plan,* dated March 6, 1998. The scope-of-work for the *Hot Spot Work Plan* includes eight tasks, as summarized below:

- Task 1 - Mobilization and inspection/testing of equipment;
- Task 2 - Installation of a soil exploration boring north of the contaminated area to characterize the underlying stratigraphy proximate to the "hot spot," specifically the depth of the bottom of the deep sand unit;
- Task 3 - Installation and development of four groundwater extraction/injection wells;
- Task 4 - Collection of concentrated organics samples and completion of a pilot study to determine optimum reagent dosage;
- Task 5 - Pumping of concentrated organics from the "hot spot" to the on-site Frac tanks for treatment;
- Task 6 - *In-situ* treatment of residual organics, if any, through the injection of Fenton reagent;
- Task 7 - Active monitoring during treatment, including sampling and analysis of water from the newly installed extraction/injection wells; and
- Task 8 - Sampling and analysis of downgradient monitoring wells in accordance with Revised Exhibit A.

2.0 PERSONNEL

All "hot spot" treatment activities will be overseen by Versar's Site Health and Safety Officer (SHSO), Mr. George R. Hartup. The SHSO will be responsible for the day-to-day administration of the health and safety program and implementation of the HSP. The specific duties of the SHSO for this phase of work include:

- Conducting a site health and safety briefing and daily safety "tailgate" meeting prior to the commencement of "hot spot" work plan activities a detailed in Section 4.2 of the HSP;

- Monitoring compliance with the HSP, including monitoring the effectiveness of decontamination as detailed in Section 9.0 of the HSP;

- The objective of this Addendum to the HSP is to assure that workers will not be exposed to unhealthy chemical levels through dermal contract, inhalation, or ingestion;

- Managing health and safety equipment (e.g., respirators, instruments, boots, gloves, suits, etc.);

- Coordinating and performing real-time ambient air monitoring as specified in Section 8.3 of the HSP and determining appropriate levels of personal protection based on this monitoring;

- Establishing work/rest regimen in conjunction with the Construction Superintendent (i.e., heat stress/cold stress monitoring);

- Continuously monitoring health and safety conditions during the implementation of the site work;

- Maintaining site safety field logs to record air monitoring results, weather conditions, employees on-site, safety problems, and other related information;

- Reporting all incidents to the HSO;

- Stopping work if conditions are deemed unsafe; also to temporarily remove an individual from the site if he/she is not complying with the HSP. In both cases, the SHSO will confer with the HSO and CS regarding the follow-up actions. The presence of an SHSO will not abrogate safety responsibilities of other personnel;

- Daily safety inspections of work areas; and

- Preparation of daily health and safety reports.

3.0 PREPARATION ACTIVITIES

All personnel will meet health and safety training regulations outlined in 29 CFR 1910.120, as well as other applicable sections. To comply with OSHA's site-specific training requirements, the SHSO will conduct a training session immediately preceding the "hot spot" activities. The SHSO will also be responsible for daily safety briefings for on-site personnel and for "visitor" site briefings.

The minimum content of the pre-field activities training is outlined below:

- Identification and discussion of physical hazards associated with drilling/monitoring well installation, as detailed in Section 5.2.11 of the HSP

- Discussion of general health and safety Standard Operating Procedures, as detailed in Section 10.0 of the HSP

- Identification of hazardous chemicals and physical agents previously identified at the Site

    - Definition of hazardous materials
    - Classification of hazardous materials

- Toxicological and physical properties of these materials

    - Expected exposure levels
    - Routes of probable exposure
        - Respiratory tract
        - Dermal penetration
        - Ingestion
    - Expected toxic effects
    - OSHA Permissible Exposure Levels (PELs) or ACGIH Threshold Limit Values (TLVs), whichever is more stringent
    - Carcinogens

- Emergency planning and principles to be used on the job site

    - Emergency medical care and treatment
    - General safety practices
    - Emergency telephone numbers

- On-site communications
- Names and responsibilities of key project safety personnel

▸ Respiratory protection level used on-site

- General principles
- Potential hazards
- Protective measures provided by air monitoring
- Response (evacuation) requirements activated by abnormally high volatile organics in ambient air

▸ Protective clothing requirements

- Level of protection
- Articles of protective clothing
- Purpose of each article of protective clothing
- Proper use of protective clothing

▸ Decontamination

- Concern regarding proper decontamination
- Extent of decontamination required
- Personnel decontamination under normal conditions
- Personnel decontamination during medical emergencies
- Decontamination of equipment
- Disposal of contaminated materials

Each day prior to the start of work activities, all site personnel will meet and sign an attendance sheet. At this time, the SHSO will indicate the work scheduled for the day and what level of protection will be required. Also, any need for changes in safety procedures will be addressed. The crews will be asked to discuss any concerns they have regarding health and safety.

The SHSO will also inspect and calibrate all field monitoring equipment prior to starting the "hot spot" work plan activities. Prior to commencing drilling activities, the SHSO will inspect the drilling equipment for the required safety features, as outlined in Section 5.2.11 of the HSP.

4.0 "HOT SPOT" WORK PLAN ACTIVITIES

During the geotechnical investigation of the Southern Concrete Pad area, ambient air monitoring indicated that levels of organics in the breathing zone were generally at or near background levels, and that elevated levels noted when a "hot spot" was encountered quickly sudsided to background levels . Consequently, the initial personal protection level for the "hot spot" activities defined in Tasks 1 through 4 of the *Hot Spot Work Plan* will be Modified Level D, as detailed in Table 7-2 of the HSP. However, during the pumping activities defined in Task 5, Level C personal protection will be used at a minimum.

Throughout the course of the "hot spot" work plan activities, PPE requirements may need to be modified (upgraded or downgraded) due to environmental concerns/site conditions (e.g., visual contamination, exceeding monitoring instrument action levels, etc.) and/or if additional analytical data becomes available which suggests an increased or decreased level of hazard. All modifications will be directed by the SHSO.

During the monitoring well installation, sampling, and treatment activities, the SHSO will conduct real-time ambient air monitoring in accordance with Section 8.3 of the HSP. Real-time monitoring will include the following equipment. VOCs will be monitored using a photoionization detector (PID) with an 11.7 eV lamp. Lower explosive limits (LEL) and oxygen concentrations will be monitored using an LEL/O_2 meter. The LEL/O_2 meter will be used to detect oxygen-deficient, oxygen-enriched, and combustible atmospheres. All monitoring instruments will be calibrated daily in accordance with the manufacturer's recommendations.

Organic vapors and lower explosive limit/oxygen percentage will be monitored throughout these activities to provide immediate feedback to the SHSO regarding potential exposures, so that actions can be taken, if necessary, to reduce vapor releases in the work area. Action levels for the "hot spot" work plan are as defined in Table 8-1 of the HSP.

A daily log will be kept at the site to record all monitoring data. The data will be summarized as part of a daily report, including parameter, instrument type, air concentration measured, time, and location.

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